£1.75

THE ILLUSTRATED
INTERNATIONAL AIRCRAFT GUIDE

FIGHTERS OF WORLD WAR II

PART 1

BERNARD FITZSIMONS
Consultant BILL GUNSTON

MONTHLY FULL COLOUR SERIES

FIGHTERS OF WORLD WAR II

PART 1

Consultant Editor
Bill Gunston

Managing Editor
Michael De Luca

Art Director
Roger Hammond

Associate Editor
John B Davies

Technical Editor
Will Fowler

Art Editor
Martin Hendry

Designer
Jerry Goldie

Picture Manager
Merle Nygate

Production
Zita Chen

Colour artwork
John Batchelor

Line illustrations
Jerry Banks
Nick Farmer

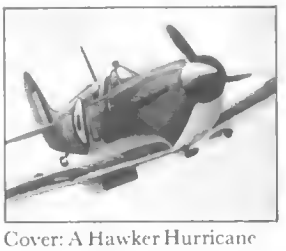
Cutaways
© Pilot Press Ltd

Three-view drawings
© Pilot Press Ltd
© Macdonald Phoebus Ltd/

Picture credits

John Batchelor 12, 21, 40, 63; Austin J Brown 44; Bundesarchiv 7; Barry Dowsett 9, 11, 14, 21, 28, 63; Flight International 24, 32; Grumman Corporation 40; Imperial War Museum 6, 24, 33; Patrick Little 9, 16; P R March 5, 15; MARS 6; Military Aircraft Photographs 4, 6, 7, 17, 22, 25, 29, 31, 32, 35, 44, 45; M O D 10; Musee de l'Air 17, 19, 29; Novosti 55; Heinz J Nowarra 22, 29, 43, 47, 53, 59, 60, 64; Michael O'Leary 5, 16, 23, 27, 31, 37, 39, 40, 41, 46, 48, 62; M B Passingham 1, 18, 38, 39, 42, 43, 47, 51, 53, 54, 55, 56, 58, 59, 60, 62, 64; Pilot Press 21, 30, 36, 45, 49, 57, 64.

Made and printed in Great Britain
Typeset by Tradespools Ltd, Frome, Somerset



Cover: A Hawker Hurricane

The six years of World War II saw some of the most dramatic changes in aircraft design and propulsion ever to be imagined. The war started with biplanes and open cockpit aircraft and ended with jets armed with air-to-air rockets. **Fighters of World War II Part 1** covers the early aircraft and some of the machines like the Bf 109 and Spitfire which remained in service throughout the war.

The book covers fighters up to the invasion of the USSR. Among the types included are the MiG-3, and LaGG-3. The P-39 Airacobra saw action with the British, Americans and the Russians who liked the heavy armament in a ground-attack role.

Machines like the Havoc, Beaufighter and Blenheim were deployed as fighters and with their twin engines were capable of carrying a very heavy cannon and machine-gun armament. Fitted with airborne interception radar some were used as night-fighters.

Contents

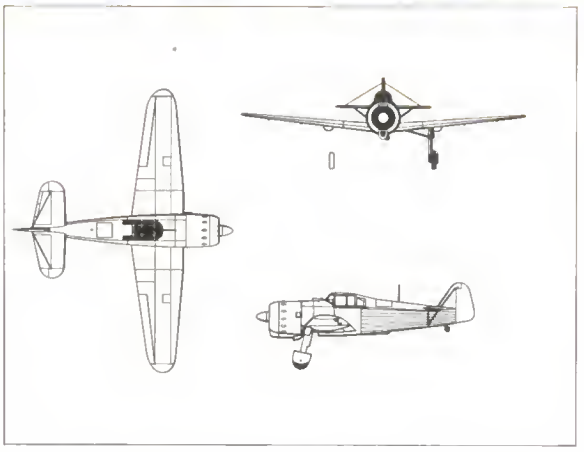
FK.58, Koolhoven

FIRST FLIGHT 1938

CONSTRUCTED in the Netherlands on the eve of World War II, powered by a French engine and armed with Belgian guns, the FK.58 saw service only with the French air force and was flown mainly by Polish pilots. As might be expected in the circumstances, not many were built. A collaborator on the 1912 Deperdussin racers, and subsequently responsible for a number of famous aircraft for the British firms of Armstrong Whitworth and BAT, Frederik 'Cully' Koolhoven returned after World War I to Holland, where the 58th design to carry his initials (the actual designer was E Schatzki, who had also designed the D.XXI for Fokker) appeared in prototype form in mid 1938.

Powered by a 1080-hp Hispano-Suiza 14Aa 10, the FK.58 was a compact monoplane of mixed construction. In October 1938 it was demonstrated at the French test centre at Villacoublay, with the result that in January 1939, 50 were ordered for service in French colonies. The first flight of a second prototype took place in February, and the following month the Dutch government ordered a further 36, to be powered by 1080-hp Bristol Taurus III engines, and the construction of ten of the French machines was sub-contracted immediately to SABCA in Belgium.

Deliveries to France began in June 1939, the first four being FK.58s with the original powerplant. The remainder were to be FK.58As, using the 1080-hp Gnome-Rhône 14N/16, and 13 of these had been delivered by September 1939. No more were delivered to France – the Belgian machines



were assembled but no engines had been supplied for them by the time of the German invasion in May 1940, exports from Holland had been banned on the outbreak of war, and the absence of the intended engines also prevented any of the Dutch machines being completed.

By this stage the French government had more pressing concerns than the supply of fighters to Indo-China, and in May 1940 the FK.58As were issued to Patrouilles de Protection to be flown principally by Polish pilots who had escaped to France. Charged with defending industrial centres, the Patrouilles de Protection were ad hoc units of whose activities little record was kept. The FK.58s had been in storage for several months, were largely unserviceable, and saw little action.

FK.58

Type: single-seat monoplane fighter
Maker: NV Koolhoven Vliegtuigen; Société Anonyme Belge de Constructions Aéronautiques (SABCA)
Span: 11 m (36 ft 1 in)
Length: 8.7 m (28 ft 6½ in)
Height: 3 m (9 ft 10 in)
Wing area: 17.21 m² (185.25 sq ft)
Weight: maximum 2750 kg (6063 lb); empty 1795 kg (3957 lb)
Powerplant: one 1080-hp Hispano-Suiza 14Aa 10 14-cylinder two-row air-cooled radial
Performance: maximum speed 504 km/h (313 mph) at 4500 m (14 764 ft); range 750 km (466 miles); service ceiling 10 400 m (34 121 ft)
Armament: four 7.5-mm (0.295-in) FN-Browning machine-guns
Crew: 1
Production: 4 (80 other airframes completed)

Above: A Koolhoven FK.58 of the Armée de l'Air showing the underwing fairing for a pair of 7.5-mm (0.295-in) machine-guns

Bf 109, Messerschmitt

FIRST FLIGHT 1935

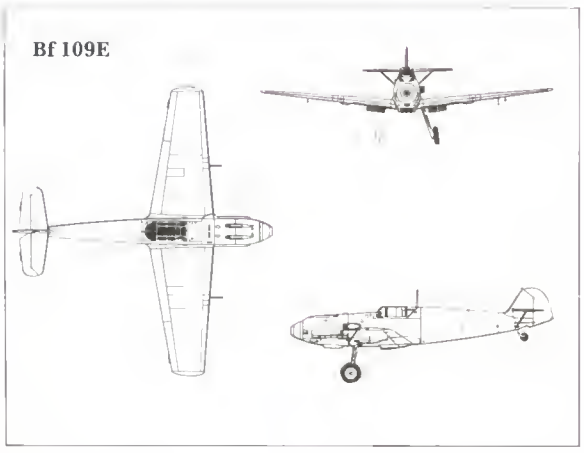
WILLI Messerschmitt's Bayerische Flugzeugwerke seemingly had little chance of meeting the requirement for a new fighter issued by the Luftwaffe in 1933: he had proved his ability as a designer, but was so out of favour with the new administration that he was officially advised to abandon aircraft manufacture and take up an academic career. Nevertheless, he persevered, to be vindicated in 1936 when comparative trials between prototypes of his Bf 109 and the Heinkel He 112 resulted in the Messerschmitt fighter being selected for production.

The first production model, deliveries of which began in February 1937, was the B-1, powered by a 635-hp Junkers Jumo 210D and armed with three 7.92-mm (0.312-in) MG 17S in the nose. Only a few B-1s were built, and they were succeeded by mid 1937 by the B-2, with a variable-pitch propeller replacing the B-1's fixed-pitch type and, in later examples, with a 640-hp Jumo 210G engine. Two squadrons of 109Bs served with the Legion Condor in Spain from mid 1937, proving markedly superior to the Republican fighters.

By early 1938 deliveries of the C-1 had started, with a redesigned nose housing two MG 17s, two more being added in the wings. The C-2 incorporated a fifth machine-gun in the nose, firing through the propeller hub.

Production was now being carried out by Arado, Erla, Fieseler and Focke-Wulf as well as Messerschmitt, as the Bayerische Flugzeugwerke was now known, and by the end of 1938 virtually all

Below: A Bf 109G-10/U4 of the last Croatian Jagdstaffel at Eichwalde, November 1944. This was a Croatian unit under command of the East Prussia Fighter Command. The Bf 109 was supplied to Axis allies such as the Hungarians, Romanians and Bulgarians; it also served after the war in Spain, Czechoslovakia and Israel



Bf 109B-2

Type: single-seat fighter
Maker: Bayerische Flugzeugwerke; Messerschmitt AG; Erla; Fieseler; Focke-Wulf and others
Span: 9.87 m (32 ft 4½ in)
Length: 8.55 m (28 ft 0¾ in)
Height: 2.45 m (8 ft 0½ in)
Wing area: 16.4 m² (176.53 sq ft)
Weight: maximum 2150 kg (4740 lb); empty 1505 kg (3318 lb)
Powerplant: one 680-hp Junkers Jumo 210Da 12-cylinder liquid-cooled engine
Performance: maximum speed 465 km/h (289 mph) at 4000 m (13 120 ft); range 692 km (430 miles); operational ceiling 8199 m (26 900 ft)
Armament: three 7.9-mm (0.31-in) MG 17 machine-guns
Crew: 1
Production: approx 34 000 (all types)

Bf 109D-1

Specification similar to the Bf 109B-2 except in the following particulars:
Length: 8.6 m (28 ft 2½ in)
Height: 2.56 m (8 ft 4¾ in)
Weight: maximum 2420 kg (5335 lb); empty 1798 kg (3964 lb)
Powerplant: one 986-hp Daimler-Benz DB 600Aa inverted-V liquid-cooled engine
Performance: maximum speed 574.5 km/h (357 mph) at 3500 m (11 480 ft); range 560 km (348 miles); operational ceiling 10 000 m (32 810 ft)
Armament: one 20-mm (0.79-in) MG FF/M cannon; two 7.9-mm (0.31-in) MG 17 machine-guns

Germany's 21 Jagdgruppen were equipped.

The next major step in Bf 109 development was the installation of the Daimler Benz DB 600 engine, with a three-blade propeller. Limited production of D-1s with this powerplant and an armament of two MG 17s and an MG FF began in late 1937. But the D-1s service career, like its production run, was short: by the end of 1938 the first E-1s had appeared, with a fuel-injected 1175-hp DB 601A engine and two wing-mounted MG FFs in addition to two MG 17s in the nose. Deliveries to service units began in February 1939.

By September 1, 1939, when the German invasion of Poland signalled the start of World War II, new production facilities in Austria were coming into use. Over 1000 109Es had been produced since the beginning of the year.

The beginning of 1940 saw the Jagdgruppen receiving the E-3, whose 1175-hp DB 601A engine had provision for an MG FF firing through the propeller hub, though it was not often carried. Other changes included a new cockpit canopy and armour protection for the pilot. Even without the extra weapon, combat losses during the invasion of western Europe were not particularly heavy, though the rapid advance through the Low Countries and France saw fighter strength eroded.

The Battle of Britain brought new problems. The 109s over England were fighting at the limit of their range, with the additional responsibility of protecting their bombers, against Hurricanes and Spitfires which were far from being outclassed.

Bf 109E-1

Specification similar to the Bf 109B-2 except in the following particulars:
Length: 8.65 m (28 ft 4½ in)
Height: 2.5 m (8 ft 2⅓ in)
Weight: maximum 2505 kg (5523 lb); empty 1840 kg (4056 lb)
Powerplant: one 1100-hp Daimler-Benz DB 601A inverted-V 12-cylinder liquid-cooled engine
Performance: maximum speed 550.4 km/h (342 mph) at 4000 m (13 120 ft); range 660 km (410 miles); operational ceiling 10 500 m (34 450 ft)
Armament: two 20-mm (0.79-in) MG FF cannon; two 7.9-mm (0.31-in) MG 17 machine-guns

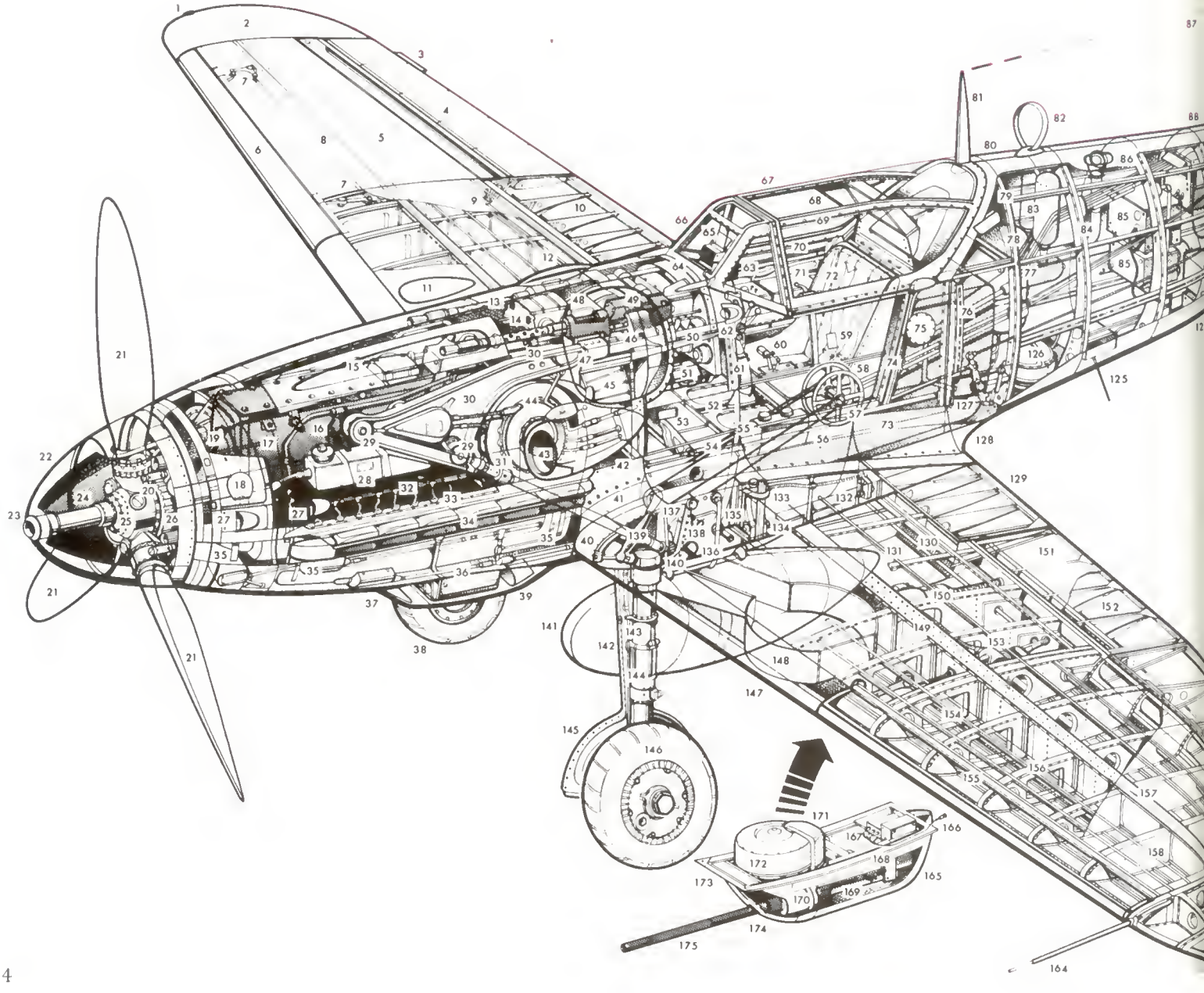
Bf 109F-4

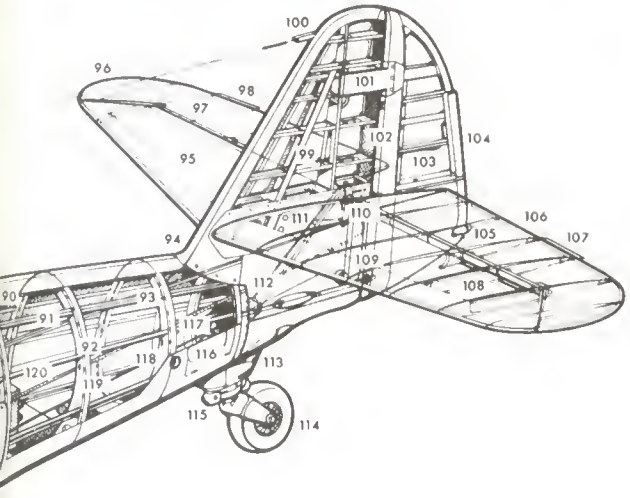
Specification similar to the Bf 109B-2 except in the following particulars
Span: 9.9 m (32 ft 5¾ in)
Length: 8.85 m (29 ft 0⅓ in)
Height: 2.59 m (8 ft 6 in)
Wing area: 16.2 m^2 (174.376 ft)
Weight: maximum 2900 kg (6393 lb); empty 2390 kg (5269 lb)
Powerplant: one 1350-hp Daimler-Benz DB 601E-1 inverted-V 12-cylinder liquid-cooled engine
Performance: maximum speed 624.4 km/h (388 mph) at 6500 m (21 325 ft); range 711 km (442 miles) with drop-tank; operational ceiling 12 000 m (39 370 ft)
Armament: one 20-mm (0.79-in) MG 151 cannon and two 7.9-mm (0.31-in) MG 17 machine-guns

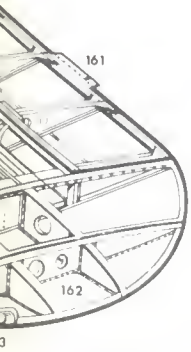
Bf 109G-6

Specification similar to the Bf 109B-2 except in the following particulars:
Span: 9.92 m (32 ft 6½ in)
Length: 8.85 m (29 ft ½ in)
Height: 2.50 m (8 ft 2½ in)
Wing area: 16.20 m^2 (174⅓ sq ft)
Weight: maximum 3398 kg (7491 lb); empty 2673 kg (5893 lb)
Powerplant: one 1475-hp Daimler-Benz DB 605AM inverted V-12 liquid-cooled engine
Performance: maximum speed 621 km/h (386 mph) at 6900 m (22 640 ft); range 560 km (348 miles); operational ceiling 11 550 m (37 894 ft)
Armament: one 30-mm (1.18-in) MK 108 or 20-mm (0.79-in) MG 151/20 cannon; two 13-mm (0.51-in) MG 131 machine-guns

Right: Bf 109E-3 with British serial AE479 which was originally in service with I/JG 76. After careful evaluation it was passed to the USA where it was written off
Centre: A Bf 109F pilot starts his pre-take-off checks in 1940. His life jacket indicates operations over the English Channel
Far right: A Bf 109E-3 with the markings of 6/JG 26. 'Yellow-nose Messerschmitts' were famous in the Battle of Britain, but most staffeln used other colours



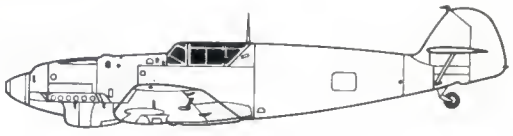




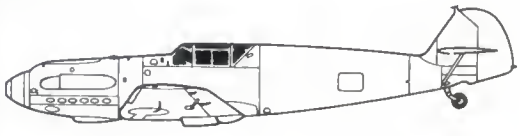
Bf 109G-14/U4

1 Right navigation light
2 Right wingtip
3 Fixed trim tab
4 Right Frise-type aileron
5 Flush-riveted stressed wing-skinning
6 Handley Page leading-edge automatic slot
7 Slot control linkage
8 Slot equalizer rod
9 Aileron control linkage
10 Fabric-covered flap section
11 Wheel fairing
12 Left fuselage machine-gun ammunition-feed fairing
13 Left Rheinmetall Borsig 13-mm MG 131 machine-gun
14 Engine accessories
15 Right machine-gun trough
16 Daimler Benz DB 605Am inverted V-12 liquid-cooled engine
17 Detachable cowling panel
18 Oil filler access
19 Oil tank
20 Propeller pitch-change mechanism
21 VDM electrically-operated constant-speed propeller
22 Spinner
23 Engine-mounted cannon muzzle
24 Blast tube
25 Propeller hub
26 Spinner back plate
27 Auxiliary cooling intakes
28 Coolant header tank
29 Anti-vibration rubber engine-mounting pads
30 Elektron forged engine bearer
31 Engine bearer support strut attachment
32 Plug leads
33 Exhaust manifold fairing strip
34 Ejector exhausts
35 Cowling fasteners
36 Oil cooler
37 Oil cooler intake
38 Right mainwheel
39 Oil cooler outlet flap
40 Wing root fillet
41 Wing/fuselage fairing
42 Firewall/bulkhead
43 Supercharger air intake
44 Supercharger assembly
45 20-mm cannon magazine drum
46 13-mm machine-gun ammunition feed
47 Engine bearer upper attachment
48 Ammunition feed fairing
49 13-mm Rheinmetall Borsig MG 131 machine-gun breeches
50 Instrument panel
51 20-mm Mauser MG 151/20 cannon breech
52 Heelrests
53 Rudder pedals
54 Undercarriage emergency retraction cables
55 Fuselage frame
56 Wing/fuselage fairing
57 Undercarriage emergency retraction handwheel (outboard)
58 Tail trim handwheel (inboard)
59 Seat harness
60 Throttle lever
61 Control column
62 Cockpit ventilation inlet
63 Revi 16B reflector gunsight (folding)
64 Armoured windshield frame
65 Anti-glare gunsight screen
66 90-mm armourglass windscreen
67 'Galland'-type clear-vision hinged canopy
68 Framed armourglass head/back panel
69 Canopy contoured frame
70 Canopy hinges (right)
71 Canopy release catch
72 Pilot's bucket-type seat (8-mm back armour)
73 Underfloor contoured fuel tank
74 Fuselage frame
75 Circular access panel
76 Tail trimming cable conduit
77 Wireless leads
78 MW 50 (methanol/water) tank
79 Handhold
80 Fuselage decking
81 Aerial mast
82 D/F loop
83 Oxygen cylinders (three)
84 Filler pipe
85 Wireless equipment packs (FuG 16zy communications and FuG 25a IFF)
86 Main fuel filler cap
87 Aerial
88 Fuselage top keel (connector stringer)
89 Aerial lead-in
90 Fuselage skin plating sections
91 'U'-stringers
92 Fuselage frames (monocoque construction)
93 Tail trimming cables
94 Tailfin root fairing
95 Right fixed tailplane
96 Elevator balance
97 Right elevator
98 Geared elevator tab
99 All-wooden tailfin construction
100 Aerial attachment
101 Rudder upper hinge bracket
102 Rudder post
103 Fabric-covered wooden rudder structure
104 Geared rudder tab
105 Rear navigation light
106 Left elevator
107 Elevator geared tab
108 Tailplane structure
109 Rudder actuating linkage
110 Elevator control horn
111 Elevator connecting rod
112 Elevator control quadrant
113 Tailwheel leg cuff
114 Castoring non-retractable tailwheel
115 Lengthened tailwheel leg
116 Access panel
117 Tailwheel shock-strut
118 Lifting point
119 Rudder cable
120 Elevator cables
121 First-aid pack
122 Air bottles
123 Fuselage access panel
124 Bottom keel (connector stringer)
125 Ventral IFF aerial
126 Master compass
127 Elevator control linkage
128 Wing root fillet
129 Camber-changing flap
130 Ducted coolant radiator
131 Wing stringers
132 Wing rear pick-up point
133 Spar/fuselage upper pin joint (horizontal)
134 Spar/fuselage lower pin joint (vertical)
135 Flaps equalizer rod
136 Rüstsatz 3 auxiliary fuel tank ventral rack
137 Undercarriage electrical interlock
138 Wing horizontal pin forward pick-up
139 Undercarriage retraction jack mechanism
140 Undercarriage pivot/bevel
141 Auxiliary fuel tank (Rüstsatz 3)
142 Mainwheel leg fairing
143 Mainwheel oleo leg
144 Brake lines
145 Mainwheel fairing
146 Left mainwheel
147 Leading-edge skin
148 Left mainwheel well
149 Wing spar
150 Flap actuating linkage
151 Fabric-covered control surfaces
152 Slotted flap structure
153 Leading-edge slot actuating mechanism
154 Slot equalizer rod
155 Handley Page automatic leading-edge slot
156 Wing stringers
157 Spar flange decrease
158 Wing ribs
159 Flush-riveted stressed wing-skinning
160 Metal-framed Frise-type aileron
161 Fixed trim tab
162 Wingtip construction
163 Left navigation light
164 Angled pitot head
165 Rüstsatz 6 optional underwing cannon gondola
166 14-point plug connection
167 Electrical junction box
168 Cannon rear mounting bracket
169 20-mm Mauser MG 151/20 cannon
170 Cannon front mounting bracket
171 Ammunition feed chute
172 Ammunition magazine drum
173 Underwing panel
174 Gondola fairing
175 Cannon barrel

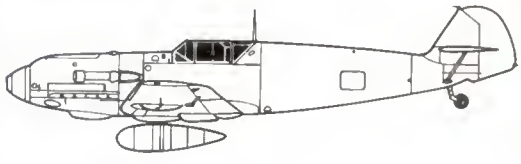
Bf 109C-1



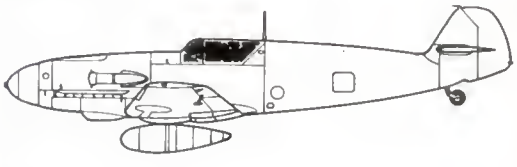
Bf 109D-1



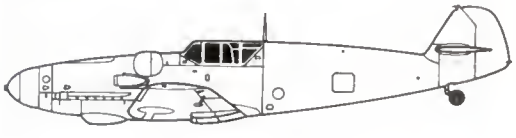
Bf 109E-7/Trop



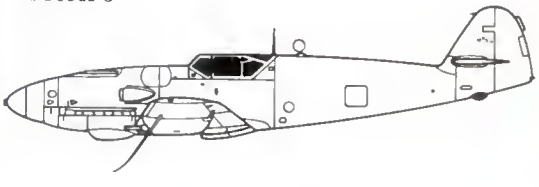
Bf 109F-4/Trop



Bf 109G-5



Bf 109K-6



The various sub-types of the G series were powered by DB 605A or 605D engines and armament was increased to one 30-mm (1.18-in) MK 103 or 108, or one 20-mm (0.79-in) cannon where these were not available, plus two 13-mm (0.51-in) MG 131s in the nose, while additional cannon were often carried in gondolas. The G-6 was designed to accept a variety of DB 605 engines and a range of operational conversions kits, the G-8 was a reconnaissance fighter, and the G-12 a trainer.

The projected high-altitude H series never progressed beyond the development stage, and the 'twin' 109Z was never built, but the 109K series began production in late 1944 with an MK 103 and two MG 151/15s in the nose. The final variant was the K-14, some with the DB 605L engine.

Total Bf 109 production amounted to some 34 000: the fighter was used by all Germany's Allies during World War II, and by Spain and Switzerland, and many continued in service after 1945 with a number of air forces. Although only 610 109Es were lost, compared with 1172 British fighters, German losses also included 235 Bf 110 escort fighters and 947 bombers.

Further 109E sub-types included the E-4, which finally abandoned the engine-mounted cannon; the E-5 and E-6 reconnaissance fighters, with no wing cannon and a fuselage-mounted camera, the E-6 having a high-compression 1200-hp DB 601N; the E-7, with provision for a drop-tank or a 250-kg (551-lb) bomb; and the E-8 and E-9, respectively equivalent to the E-7 and E-5 but with 1350-hp DB

Above left; The development of the Bf 109, ending in the K, which was the final production series and had a taller vertical tail. The Bf 109E-7/Trop and the 109F-4/Trop are fitted with 300-litre (66-Imp gal) drop-tanks

Above: A Bf 109E-4/Trop of I/JG 27 flies over scrub-covered desert in Cyrenaica in 1941. The Trop versions were fitted with filters against sand and grit. They were used not only in North Africa but also in dusty areas of the Soviet Union

Far left: The Bf 109 V20 which was originally Bf 109E-08 and was then fitted with an engine-mounted MG FF/M 20-mm (0.79-in) cannon during trials
Centre: The Bf 109F-1 had a 1200-hp DB 601N engine and a performance superior to the Spitfire V at altitude
Left: Günther Rall, Germany's third-highest ace with 275 victories, in his Bf 109F on the Eastern Front

601E engines. Fighter-bomber and tropical modifications of these models were also produced, while the E-7/Z introduced the GM-1 nitrous oxide booster used on many later variants. The E-1 also formed the basis for the Bf 109T carrier fighter.

So far the basic airframe had been left more or less alone, but during 1940 extensive redesign went into the 109F, which was given a bigger spinner, new nose, improved air collection for the supercharger and radiators, different ailerons, rounded wingtips, a smaller rudder, unbraced horizontal tail and fully retracting tailwheel. It was also intended to have the 1350-hp DB 601E, but because of a shortage of this powerplant the F-1 entered service in January 1941 with the DB 601N. No wing armament was carried, two MG 17s and an MG FF being mounted in the nose, but the F-2 substituted a 15-mm (0.59-in) MG 151/15 for the MG FF.

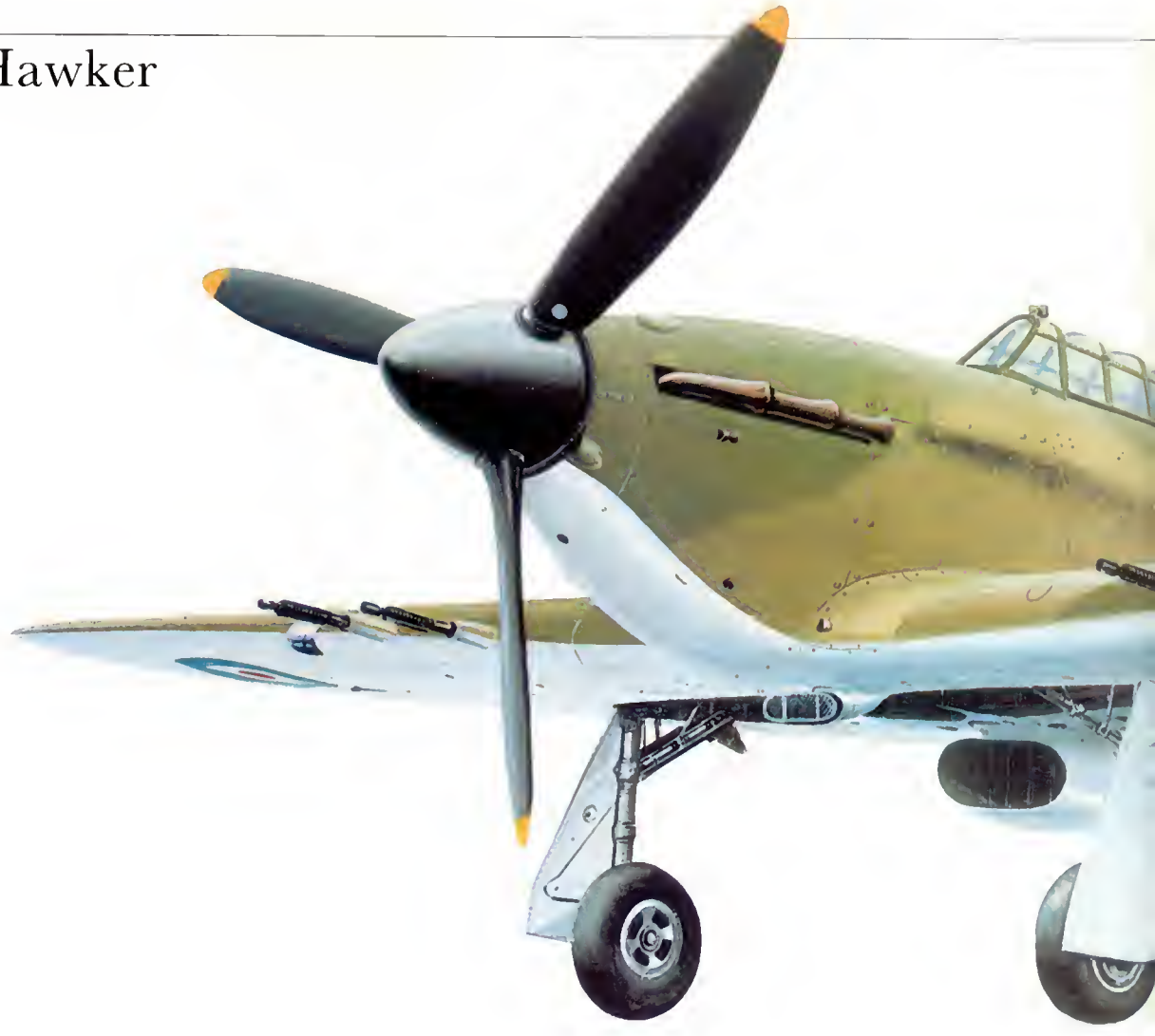
The F-3 introduced the DB 601E engine early in 1942, and the F-4 added a 20-mm MG 151/20 and greater pilot protection. The F-5 and F-6 were reconnaissance fighters, the former losing its cannon and the latter carrying no armament. As with the E series, fighter-bomber conversions were produced, while some Fs were given a pair of MG 151/20s in a gondola below the fuselage.

Over 2000 Fs had been produced by the end of 1941, when the G series began to take over. A total of 23 000 109Gs were built, over 14 000 of them in 1944 alone – an astonishing number for a fighter already past its peak.

Above: The Bf 109B-1 which was first delivered to JG 132 Richthofen in February 1937. The B was nicknamed Bertha by its crews, and these names stuck with each sub-type, so the C became Clara, the D Dora, the E Emil, and the G Gustav; the F does not appear to have been named

Hurricane, Hawker

FIRST FLIGHT 1935

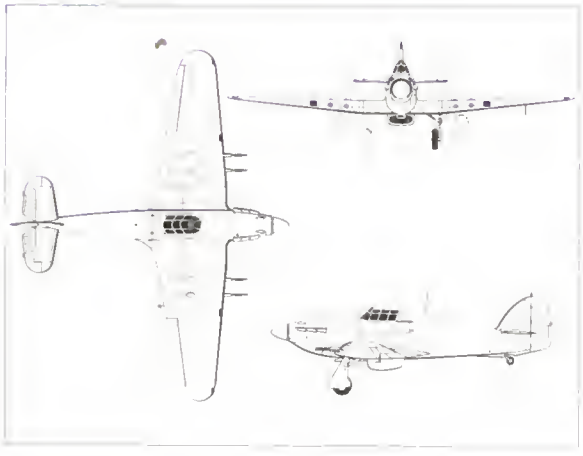


THE development of the RAF's first monoplane fighter, not counting the RFC's excellent Bristol M.1C of 1917, began in 1933 with the projected Fury Monoplane. This was intended as a four-gun, fixed-landing gear single-wing conversion of the Hawker Fury biplane to be powered by a 660-hp steam-cooled Goshawk engine. Anticipation of the Rolls-Royce PV.12 (later named Merlin) engine caused the Fury conversion to be abandoned, and a new 'Interceptor Monoplane' was planned to meet a revised specification for a four-gun fighter.

Hawker were given the go-ahead for construction of a prototype in February 1935, but by the time the prototype flew in November that year, British licence production of the Browning machine-gun in 0.303-in (7.7-mm) calibre had been agreed, and the design was further revised to accommodate eight in the wings.

Trials in early 1936 showed a top speed of 507 km/h (315 mph), and with minor revisions to the controls, landing gear and sliding canopy, 600 production aircraft were ordered in July 1936, the same month that the name Hurricane was bestowed. First deliveries were to No 111 Squadron at the end of 1937, and Nos 3 and 56 Squadrons were equipped in 1938. This was entirely because in January 1936, long before the Air Ministry had even hinted at an order, the Hawker Siddeley board had tooled up to make 1000 at Kingston and a new factory at Langley, near Slough.

The decision to adopt the eight-gun armament led to the development of an all-metal stressed-skin wing as early as 1935, but production aircraft

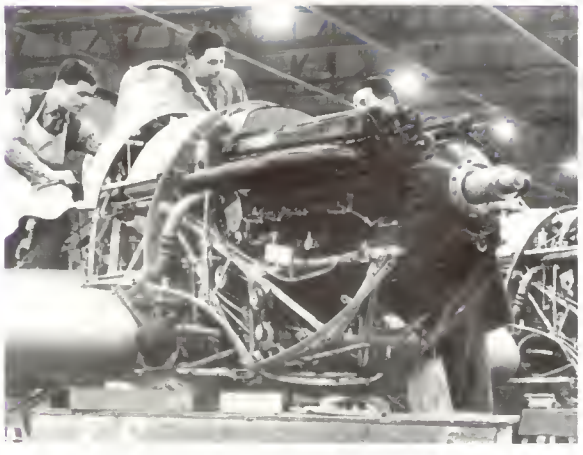


delivered before the autumn of 1939 were fitted with the traditional fabric-covered wing. Meanwhile, trials had also been carried out with variable-pitch propellers, which offered much improved take-off and climb performance, and DH and Rotol variable-pitch models became standard in 1940.

The installation of the 1260-hp Merlin XX engine was the basic distinguishing feature of the Mk II, a converted Mk I flying for the first time with this powerplant in June 1940. New wings with different armament options resulted in a number of sub-series. The IIA retained the Mk I wing, but the IIB had twelve wing-mounted Brownings, the IIC four 20-mm (0.79-in) Hispano-Suiza drum-feed cannon and the IID, which first flew in

Hurricane IIC

Type: monoplane fighter and fighter-bomber
Maker: Hawker Aircraft Ltd; Gloster Aircraft Co Ltd
Span: 12.19 m (40 ft)
Length: 9.81 m (32 ft 2¼ in)
Height: 2.67 m (8 ft 9 in)
Wing area: 23.93 m² (257.6 sq ft)
Weight: maximum 3649 kg (8044 lb); empty 2566 kg (5658 lb)
Powerplant: one 1260-hp Rolls-Royce Merlin XX V-12 liquid-cooled engine
Performance: maximum speed 529 km/h (329 mph) at 5487 m (18 000 ft); range 740 km (460 miles); operational ceiling 10 851 m (35 600 ft)
Armament: four 20-mm (0.79-in) Hispano-Suiza cannon; 454 kg (1000 lb) of bombs
Crew: 1
Production: 4711



Top: The Hurricane IIC was first delivered to the RAF in June 1941. It served not only in Europe but also in North Africa and the Far East
Far left: The 'tin opener' tank-busting IID with 40-mm (1.57-in) cannon
Above: One of the few surviving IICs of the RAF Memorial Flight
Left: The Hurricane production line at Kingston; this comparatively old fighter destroyed more enemy aircraft in the Battle of Britain than all other fighters and the AA guns combined

September 1941, carried a pair of 40-mm (1.57-in) Vickers S cannon for anti-tank work in North Africa. The last three could also accommodate a 113-kg (250-lb) or 227-kg (500-lb) bomb under each wing, on hardpoints which from late 1941 were plumbed for drop-tanks.

This multiplicity of armament options was rationalized in the Hurricane IV, originally designated Mk IIE, whose wings provided stations for 40-mm cannon, bombs or rockets; the powerplant was a 1620-hp Merlin 24 or 27, driving a four-blade propeller and 794 were produced, including 270 IIEs. The Mk III was an unbuilt version with the Packard-built Merlin, and the two Mk Vs were Hurricane IV conversions with Merlin 32s driving four-blade propellers. The Canadian Car and Foundry company began building Hurricane Is in 1939, and remaining designations covered CCF Hurricanes using Packard-built Merlin 28 or 29 engines. The Mk X and XI corresponded to the IIB, the latter having Canadian equipment, and the Mk XII and XIIA (Merlin 29) were distinguished by the number of guns, respectively eight and twelve Brownings.

Total Hurricane production amounted to 14 233, the majority by Hawker but including 2750, principally Mk Is, supplied by Gloster and 1451 built by CCF. The only other firms to build the fighter were Avions Fairey in Belgium, who contributed two of the above total, and Rogožarski in Yugoslavia, who built another handful to back up 24 supplied by Britain. Although most exports, which included orders from Turkey, Poland and Iraq, were curtailed by the war, over 100 found their way to overseas customers, and there were postwar sales to Portugal and Iran, included in which were various tandem dual trainers.

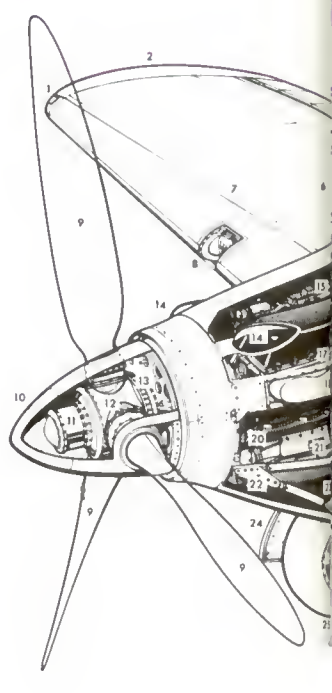
This bare summary of Hurricane development and production gives little hint of the type's astonishing versatility. In its original role of interceptor it saw heavy fighting in Norway and France in 1940, before forming the mainstay of Fighter Command during the Battle of Britain, in which no fewer than 1715 examples took part, outnumbering the combined total of all other RAF aircraft, and claiming nearly four-fifths of the 1792 German aircraft destroyed.

It continued to serve in the home-defence role when the Luftwaffe switched to night raids, at the same time expanding its sphere of operations to the Mediterranean, North Africa and the Middle East during 1940, and to the Far East in 1941. In August 1941, the first of an eventual total of 2952 Mks II and IV were despatched to the Soviet Union. Hurricanes generally delivered their various ordnance loads to telling effect in all their many theatres of operations. They proved particularly valuable in Burma and also carried out second-line tasks.

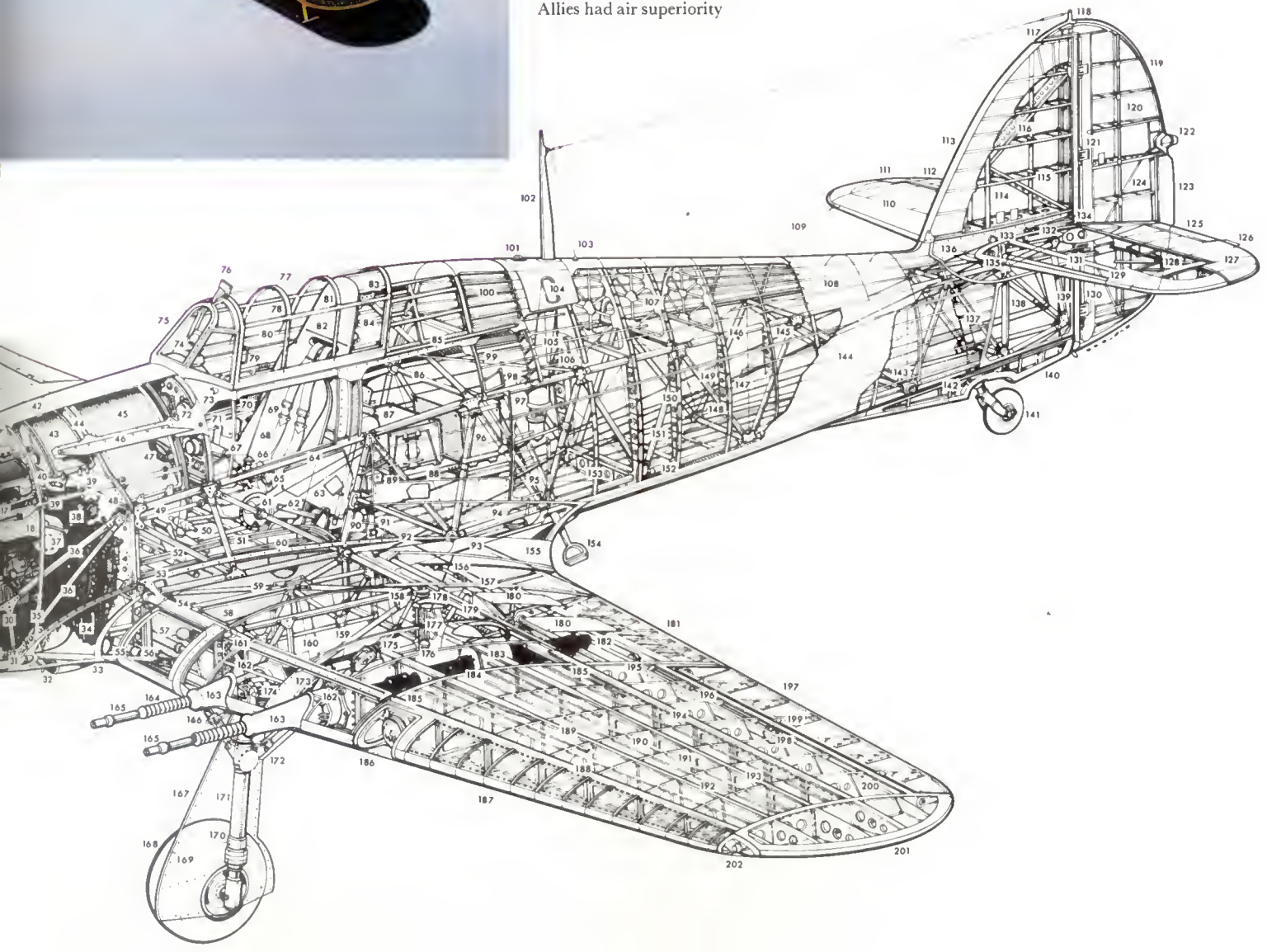
Finally, not the least of the Hurricane's contributions to Allied victory came at sea. Surplus Mk Is were fitted with catapult spools for use aboard Catapult Armed Merchantmen for convoy protection as Sea Hurricane IAs, from early 1941. Thereafter arrester hooks were added to enable Sea Hurricanes to operate from aircraft carriers.

Mk IIC

1 Right navigation light
2 Right wingtip
3 Aluminium alloy aileron
4 Ball-bearing aileron hinge
5 Aft wing spar
6 Aluminium alloy wing skinning
7 Forward wing spar
8 Right landing light
9 Rotol three-blade propeller
10 Spinner
11 Propeller hub
12 Pitch-control mechanism
13 Spinner back plate
14 Cowling fairings
15 Coolant pipes
16 Rolls-Royce Merlin XX engine
17 Cowling panel fasteners
18 'Fishtail' exhaust pipes
19 Electric generator
20 Engine forward mounting feet
21 Engine upper bearer tube
22 Engine forward mount
23 Engine lower bearer tubes
24 Right mainwheel fairing
25 Right mainwheel
26 Low-pressure tyre
27 Brake drum (pneumatic brakes)
28 Manual-type inertia starter
29 Hydraulic system
30 Bearer joint
31 Auxiliary intake
32 Carburettor air intake
33 Wing root fillet
34 Engine oil drain collector/breather
35 Fuel pump drain
36 Engine aft bearers
37 Magneto
38 Two-stage supercharger
39 Cowling panel attachments
40 Engine RPM indicator drive
41 External head sight
42 Aluminium alloy cowling panels
43 Engine coolant header tank
44 Engine firewall
45 Fuselage (reserve) fuel tank
46 Exhaust glare shield
47 Control column
48 Engine bearer attachment
49 Rudder pedals
50 Control linkage
51 Centre-section fuel tank
52 Oil system piping
53 Pneumatic system air cylinder
54 Wing centre-section
55 Engine bearer support strut
56 Oil tank
57 Dowty undercarriage ram
58 Left undercarriage well
59 Wing centre-section girder frame
60 Pilot's oxygen cylinder
61 Elevator trim tab control wheel
62 Radiator flap control lever
63 Entry footstep
64 Fuselage tubular framework
65 Landing lamp control lever
66 Oxygen supply cock
67 Throttle lever
68 Safety harness
69 Pilot's seat
70 Pilot's break-out exit panel
71 Map case
72 Instrument panel
73 Cockpit ventilation inlet
74 Reflector gunsight
75 Bullet-proof windscreen
76 Rear-view mirror
77 Rearward-sliding canopy
78 Canopy frames
79 Canopy handgrip
80 Plexiglas canopy panels
81 Head/back armour plate
82 Harness attachment
83 Aluminium alloy decking
84 Turnover reinforcement
85 Canopy track
86 Fuselage framework cross-bracing
87 Radio equipment (TR9D/TR133)
88 Support tray
89 Removable access panel
90 Aileron cable drum
91 Elevator control lever
92 Cable adjusters
93 Wing/fuselage fillet
94 Ventral identification lights
95 Footstep retraction guide
96 Radio equipment (R3002)
97 Recognition apparatus
98 Handhold
99 Diagonal support
100 Fuselage fairing
101 Dorsal identification light
102 Aerial mast
103 Aerial lead-in
104 Recognition apparatus cover panel
105 Mast support
106 Wire-braced upper truss
107 Wooden fuselage fairing formers
108 Fabric covering
109 Radio antenna
110 All-metal tailplane structure
111 Elevator balance
112 Right elevator
113 Tailfin metal leading-edge
114 Fabric covering
115 Tailfin structure
116 Diagonal bracing struts
117 Built-in static balance
118 Aerial stub
119 Fabric-covered rudder
120 Rudder structure
121 Rudder post
122 Rear navigation light
123 Balanced rudder trim tab
124 Wiring
125 Elevator trim tab
126 Fixed balance tab
127 Fabric-covered elevator
128 Tailplane rear spar
129 Tailplane front spar
130 Rudder lower hinge
131 Rudder operating lever
132 Connecting rod
133 Control pulleys
134 Elevator operating lever
135 Tailplane spar attachments
136 Aluminium alloy tailplane
137 Tailwheel shock-strut
138 Angled frame rear structure
139 Sternpost
140 Ventral fin
141 Dowty oleo-pneumatic tailwheel
142 Fin framework
143 Handling-bar socket
144 Fabric covering
145 Swaged tube and steel gusset fitting
146 Upper tube/longeron
147 Rudder cables
148 Wooden stringers
149 Elevator cables
150 Aluminium alloy formers
151 Diagonal brace wires
152 Lower tube/longeron
153 Aluminium alloy former
154 Retractable entry footstep
155 Wingroot fillet
156 Flap rod universal joint
157 Aileron cables
158 Wing rear spar girder attachment
159 Main wing fuel tank
160 Glycol radiator and oil cooler
161 Front spar wing fixings
162 Cannon forward mounting bracket
163 Cannon fairing
164 Recoil spring
165 Cannon barrels
166 Undercarriage retraction jack
167 Undercarriage fairing
168 Low-pressure tyre
169 Left mainwheel
170 Mainwheel shock-strut
171 Oleo-pneumatic cylinder
172 Landing gear drag strut
173 Leading-edge armament doors
174 Landing gear pivot point
175 Undercarriage sliding joint
176 Armament access plates
177 Rear spar wing fixing
178 Magazine blister fairings
179 Gun heating manifold
180 Breech-block access plates
181 Metal flaps
182 Cannon breech-blocks
183 Ammunition magazine drum
184 Left outer 20-mm Hispano cannon
185 Spar section change
186 Left landing light
187 Leading-edge structure
188 Front main spar
189 Forward intermediate spar
190 Stringers
191 Rib formers
192 Aluminium alloy wing skinning
193 Rear intermediate spar
194 Rear spar
195 Aileron control pulley
196 Aileron inboard hinge
197 Aluminium alloy aileron
198 Aileron control gear main pulley
199 Self-aligning ball-bearing hinge
200 Aileron outboard hinge
201 Detachable wingtip
202 Left navigation light



Left: PZ865, one of the final batch of 112 Hurricane IICs; later it was painted blue/gold and given civil registration G-AMAU
Above: *Our John*, a Hurricane IID in North Africa. The two Vickers S anti-tank guns under the wings slowed down the aircraft, but this was no great disadvantage when the Allies had air superiority



Spitfire, Supermarine

FIRST FLIGHT 1936

THE name Spitfire was first applied – unofficially – to the Supermarine Type 224, a low-wing monoplane completed in 1933 with fixed undercarriage, a machine-gun in each wing root and each wheel fairing, and a 660-hp Rolls-Royce Goshawk III engine. Armament and engine had been stipulated by a 1930 specification, but Supermarine designer Reginald Mitchell was already having further thoughts which materialized in late 1935 as the Type 300. The Type 224's inverted gull wings were replaced by straight-taper elliptical wings housing outward-retracting undercarriage and the eight Browning machine-guns called for by subsequent specifications, while power was provided by a 990-hp Rolls-Royce Merlin C engine. Successful trials and a top speed of 562.5 km/h (349½ mph) led to a first order for 310 Spitfire Is, and deliveries to 19 Squadron began in mid 1938.

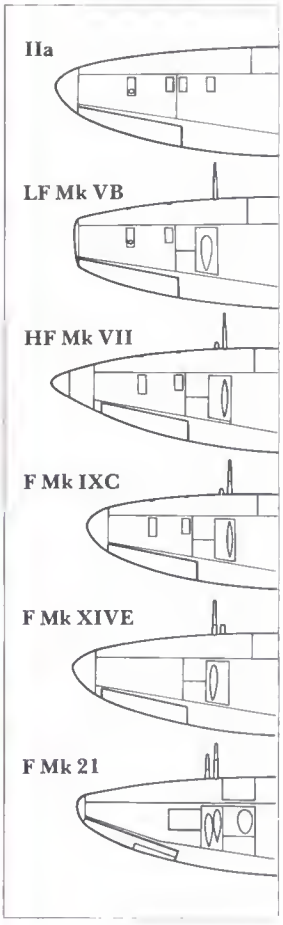
The 1583 Spitfire Is included early examples with only four machine-guns, and a small number of Mk IBs, with four machine-guns and a pair of drum-fed Hispano-Suiza 20-mm (0.79-in) cannon, the eight-Browning type becoming the Mk IA: powerplant was a 1030-hp Merlin II or III. The 920 Mk IIA and IIB which followed were similarly differentiated by armament, changes including the use of the 1175-hp Merlin XII driving a three-blade constant-speed propeller and the provision of modest armour protection, substantially increased on later models. The Mk III was an experimental machine, while the Mk IV was the first of a series of photographic reconnaissance variants, and the next production fighter version was the Mk V. This was numerically the most important Spitfire, a total of 6479 being produced.

Among the improvements were structural strengthening and the use of 1470-hp Merlin 45, 50 and 50A, and 1415-hp Merlin 46 engines. Again, VA (94 built) and VB (3923 built) were distinguished by the armament carried, while the VC introduced a new wing capable of accommodating either of the above options or two cannon and a 113-kg (250-lb) bomb; alternatively, a drop-tank or a 227-kg (500-lb) bomb could be carried below the fuselage. As their role switched from interception to ground attack many Mk Vs had their wingtips removed and 1585-hp Merlin 45M, 50M or 55M engines fitted to become LF IX low-altitude fighters.

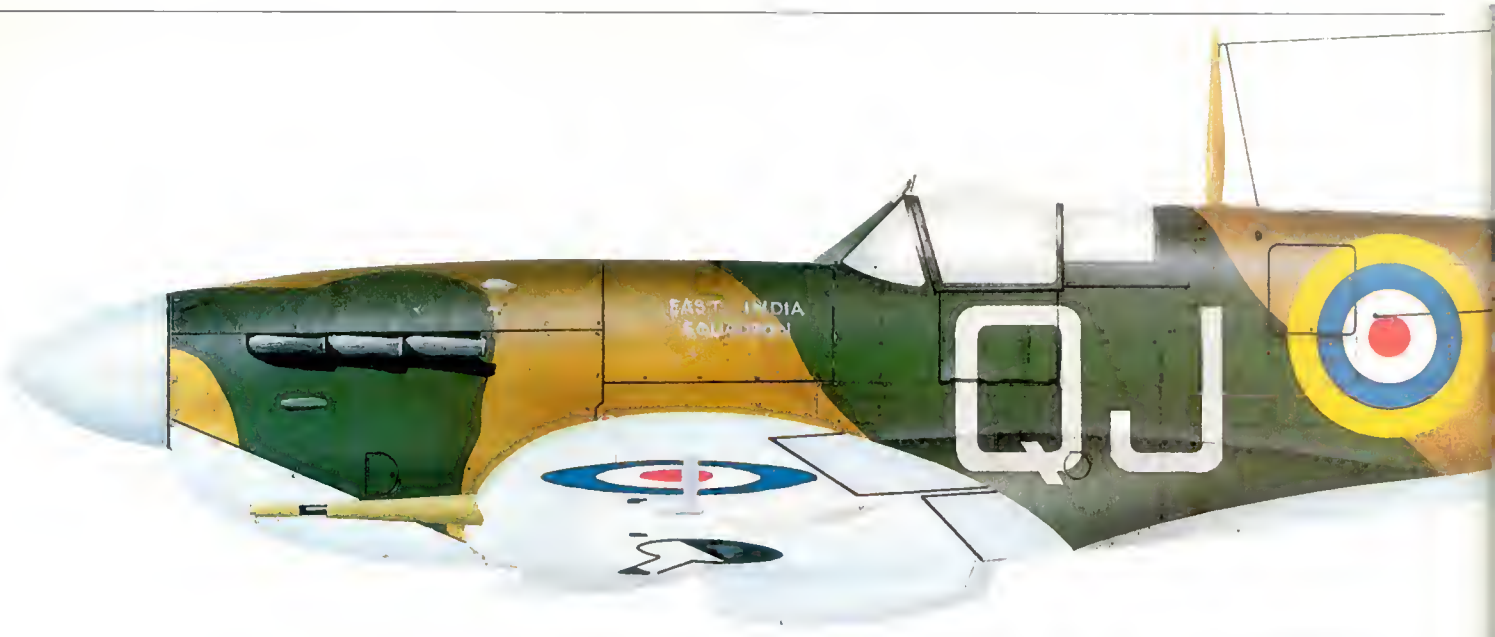
In contrast, the Mk VI was a high-altitude Mk VB development, featuring enlarged wings of 12.24 m (40 ft 2 in) span, a 1415-hp Merlin 47 engine driving a four-blade propeller and cabin pressurization, which increased the operational ceiling to 12 192 m (40 000 ft). Only 100 were built, these being followed from April 1942 by 140 of the more specialized Mk VIIs, whose length was increased to 9.54 m (31 ft 3½ in) to accommodate a 1520-hp Merlin 61 or 1710-hp Merlin 64. Most of the 1658 Mk VIIIs were low-altitude, clipped-wing versions of the Mk VII without cabin pressurization and powered by the 1720-hp Merlin 66, though 267 F VIIIs had the standard wing and Merlin 61 or 63 and 160 were HF VIIIs with extended wings and Merlin 70 engines.

Meanwhile, the orderly development of aircraft and engine was disrupted towards the end of 1941

Left: A Spitfire IX; this aircraft preserved in the USA has a modern VHF antenna behind the original mast. The Mk IX was never planned at all; it was a hasty lash-up to get the two-stage Merlin 61 into the Mk V airframe. It kept being re-ordered, keeping out the definitive Mk VIII



Above: The elliptical wing shape of the Spitfire altered a little during its life. Some marks were clipped for fast low level flight, the wings being not only stronger with this shape, but allowing the aircraft to make tight rolls. The long tapered points on types like the HF VII were for high-altitude interceptors which could tackle German reconnaissance aircraft. The armament changed with a mix of cannon and machine-guns. It is a tribute to the wings and airframe that the Spitfire could be fitted with more powerful engines and weapons

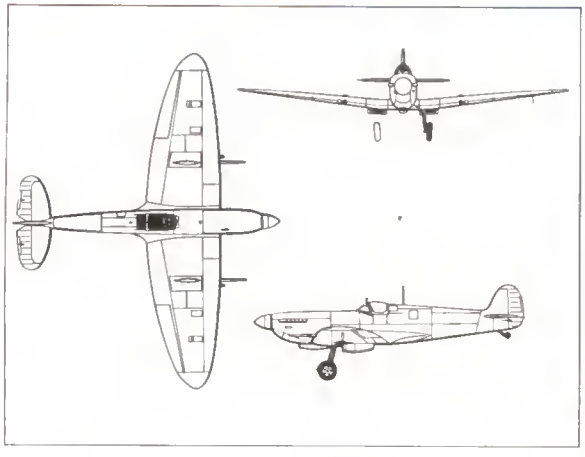


Spitfire I

Type: interceptor and fighter-bomber
Maker: Supermarine Division of Vickers-Armstrongs Ltd in factories at Southampton, Winchester, Swindon and Castle Bromwich, and numerous subcontractors
Span: 11.23 m (36 ft 10 in)
Length: 9.12 m (29 ft 11 in)
Height: 2.69 m (8 ft 10 in)
Wing area: 22.48 m^2 (242 sq ft)
Weight: maximum 2623 kg (5784 lb); empty 2102 kg (4810 lb)
Powerplant: one 1030-hp Rolls-Royce Merlin II or III V-12 liquid-cooled engine
Performance: maximum speed 571 km/h (355 mph) at 5791 m (19 000 ft); range 636 km (395 miles) operational ceiling 10 363 m (34 000 ft)
Armament: eight 7.7-mm (0.303-in) machine-guns (IA) or four machine-guns and two 20-mm (0.79-in) cannon (1B)
Crew: 1
Production: 1583

Mk VC

Specification similar to Spitfire I except in following particulars:
Height: 3.48 m (11 ft 5 in)
Weight: maximum 3078 kg (6785 lb); empty 2313 kg (5100 lb)
Powerplant: one 1470-hp Rolls-Royce Merlin 45 V-12 liquid-cooled engine
Performance: maximum speed 602 km/h (374 mph) at 3963 m (13 000 ft); range 756 km (470 miles); operational ceiling 11 278 m (37 000 ft)
Armament: two 20-mm (0.79-in) Hispano-Suiza cannon; four 0.303-in (7.7-mm) Browning machine-guns or four 20-mm cannon; 227 kg (500 lb) of bombs
Production: 2447 (6479 all Mk Vs)

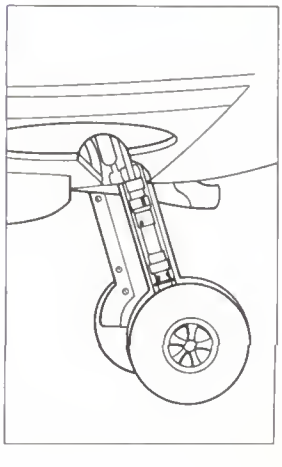


Mk XVI

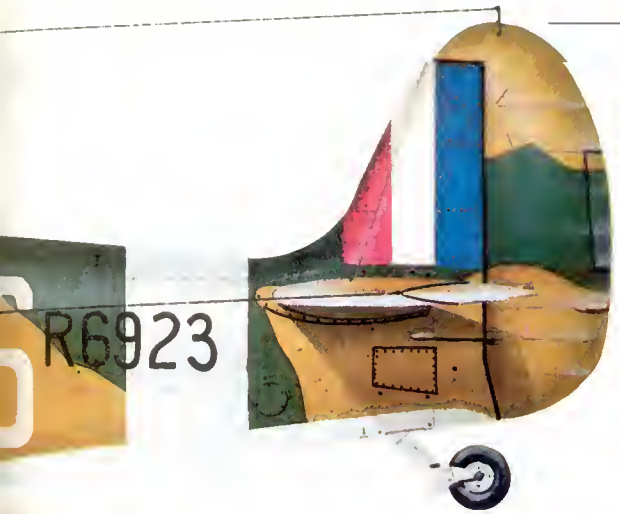
Specification similar to Spitfire I except in the following particulars:
Span: 9.98 m (32 ft 8 in)
Length: *9.55 m (31 ft 4 in)*
Height: 3.86 m (12 ft 8 in)
Wing area: 23.04 m^2 (248 sq ft)
Weight: maximum 3311 kg (7300 lb); empty 2631 kg (5800 lb)
Powerplant: one 1720-hp Packard Merlin 266 liquid-cooled engine
Performance: maximum speed 652 km/h (405 mph) at 6706 m (22 000 ft); range 698 km (434 miles); operational ceiling 12 192 m (40 000 ft)
Armament: two 20-mm (0.79-in) cannon; four 7.7-mm (0.303-mm) machine-guns; provision for 454 kg (1000 lb) of bombs or rockets
Production: 1054

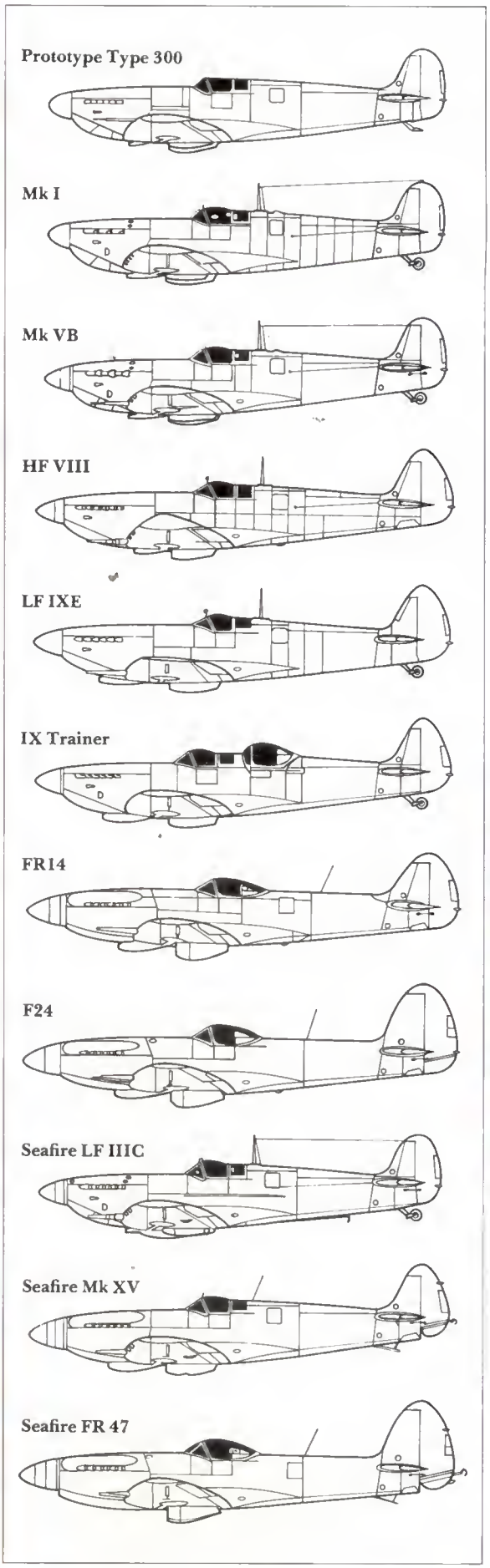
Mk XIV

Specification similar to Spitfire I except in the following particulars:
Length: 9.95 m (32 ft 8 in)
Height: *3.86 m (12 ft 8 in)*
Wing area: 22.67 m^2 (244 sq ft)
Weight: maximum 4663 kg (10 280 lb); empty 2994 kg (6600 lb)
Powerplant: one 2050-hp Rolls-Royce Griffon 65 engine
Performance: maximum speed 721 km/h (448 mph) at 7925 m (26 000 ft); range 1368 km (850 miles); operational ceiling 13 564 m (44 500 ft)
Armament: two 20-mm (0.79-in) Hispano Mk II cannon; two 0.5-in (12.7-mm) Browning machine-guns; provision for 454 kg (1000 lb) of bombs
Production: 957 (total Spitfires of all types excluding Seafires 20 351)



Above: Built to specification F.4/40, DP 845 was a special prototype for the Spitfire III, IV and Griffon-engined XX in succession
Left: A close up of the narrow, outward retracting landing gear of the Spitfire; despite a variety of changes to the powerplant and airframe, the landing gear remained geometrically the same in all marks
Right: The prototype Type 502, a postwar two-seat conversion of the Spitfire 8. Six similar machines went to the Irish Air Corps for pilot training





Far left: The Spitfire V was one of the most widely produced types. This version, the VB, normally received a Merlin 45 or 50, but one captured aircraft was powered by a DB 605A. This aircraft retained its radiator and oil-cooler and with its German engine flew in comparative tests against the Bf 109G. Though slower than the Bf 109 it was more manoeuvrable, had a greater rate of climb and superior ceiling

Left: The changing shape of the Spitfire; not only did the engines become more powerful, but the canopy was improved to better all-round visibility and a whip antenna replaced the earlier mast. Four of the eight machine-guns were replaced by two cannon and aircraft were given underwing points to take bombs or rockets. Despite all these changes the aircraft remained a Spitfire, and one of the best fighters of World War II

Above: A Spitfire IA which was brought up to Mk V standard during the war and subsequently fitted with a non-standard four-blade propeller and six-stub exhausts. The access to the cockpit is open – it allowed pilots to climb quickly into the narrow confine of the cockpit

Left: A Spitfire IX with D-Day invasion stripes; these striking bands of black and white allowed AA gunners to distinguish Allied from enemy aircraft without having to identify the specific machine. They were painted onto all aircraft supporting the landings in Normandy in June 1944

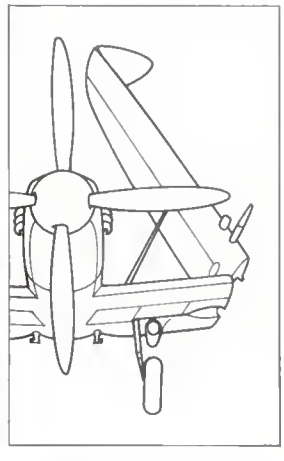
by the appearance of the Focke-Wulf Fw 190. The superiority of the new German fighter was such that the outclassed Mk V was given the 60-series Merlin as the Mk IX: intended as a temporary expedient, production of this variant reached a total of 5665, mainly LF IXs but including 1255 F IXs and 400 HF IXs. Deliveries began in mid 1942, and in 1944 a new wing was introduced to carry one 12.7-mm (0.5-in) machine-gun and one cannon. Last of the Merlin-powered Spitfire fighters were the 1054 Mk XVIs, which used the 1705-hp Packard-built Merlin 266 and were fitted with a bubble canopy.

Another Mk V development was the Seafire. In 1941 a Mk VB was fitted with an arrester hook for carrier landing trials, and the success of these led to 170 being converted as Seafire Mk IBs, with catapult attachment points and naval equipment for carrier service. A further 372 Mk IICs were purpose-built naval versions of the Spitfire VC, 110 being low-altitude versions with the 1645-hp Merlin 32. The 1250 Seafire IIIs introduced folding wings and had provision for rocket-assisted take-off gear; the powerplant was the Merlin 55.

Further Spitfire variants were based on the Rolls-Royce Griffon engine. First was the F XII, with 1735-hp Griffon III or IV and four-blade propeller, and this was followed by 957 F XIVs with 2050-hp Griffon 65 or 67 and five-blade propeller. Strengthened fuselage and undercarriage and increased fuel capacity distinguished the 100 F XVIII and 200 camera-equipped FR XVIII, and the F 21 (122 built) finally dispensed

with the elliptical wing in favour of a new wing, mounting two cannon, which was also used on the 278 F 21s and 54 F 24s. The last three versions used the Griffon 61 or 85, the latter driving contra-rotating six-blade propellers, similar engines being used by the Seafire F 45, F 46 and F 47. Total Seafire production was 2622 and included 434 F XVs and 232 F XVIIs with Griffon VIs: later models were produced after the war, and only 164 were built before production ended in March 1949. The last F 24 was delivered in February 1948.

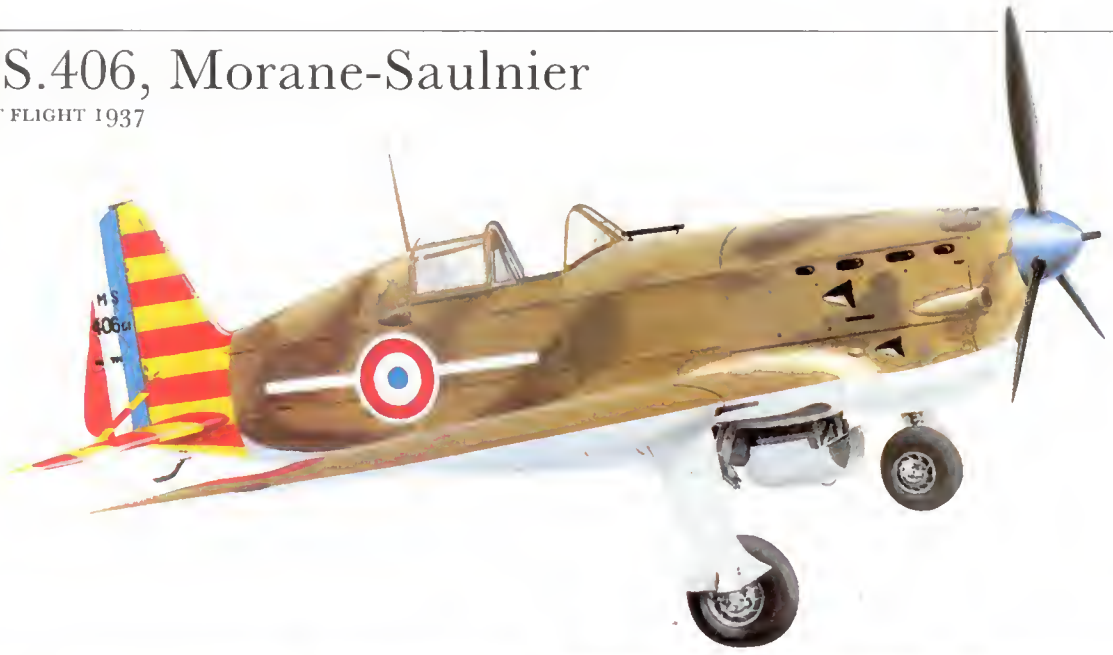
The Spitfire's achievements are legion: its exploits during the Battle of Britain have made it one of the most famous of all fighters, and it was the *only Allied fighter to remain in continuous production* throughout World War II.



Above: The wingfold on the Mk III Seafire. This modification resulted in a small loss in torsional rigidity and fall-off in performance, but allowed the Spitfire to go to sea and gave the Fleet Air Arm a potent interceptor
Above left: The Seafire F 46, with contra-rotating propellers, was the penultimate version

MS.406, Morane-Saulnier

FIRST FLIGHT 1937

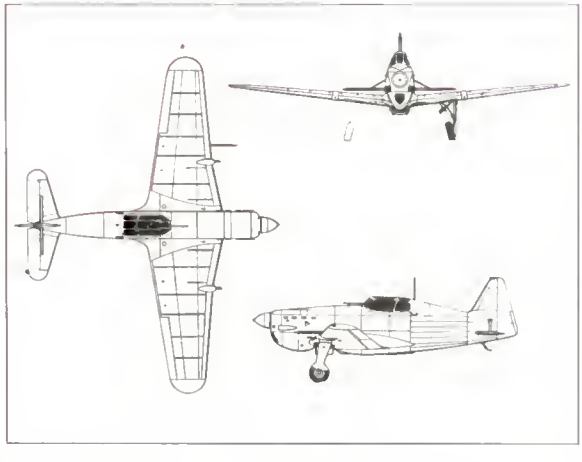


Left: A Morane-Saulnier MS. 406 in Vichy markings; these yellow and red bands distinguished the aircraft as non-combatant, though they were used by the French against the Allies in North Africa and Syria
Below left and right: The MS. 406 was exported to Turkey, Lithuania, Poland and China, though not all reached their destination. The Germans supplied the Finns with numerous MS. 406s, some being re-engined with the Soviet 1300-hp Klimov M-105P and called LaGG-Moranes or Super-Moranes. They saw action in 1944

IN response to a 1934 Armée de l'Air specification, the first prototype MS.405 flew in August 1935 and was followed by a revised second prototype in February 1937, by which time 15 pre-production aircraft had been ordered. Instead of earlier versions of the Hispano-Suiza 12Y engine one pre-production machine was fitted with the 860-hp 12Y-31 engine which incorporated a 20-mm (0.79-in) Hispano-Suiza cannon mounted between the cylinders and firing through the propeller hub, to become the prototype MS.406. Others were modified to become the parachute trials MS.407LP; the MS.408 and 411 which served as prototypes for the Swiss licence-built D-3800 and D-3801 versions; the MS.409 with a new radiator installation; and the MS.410 with four 7.5-mm (0.295-in) MAC 1934 machine-guns in the strengthened wings.

Production for the Armée de l'Air was of the MS.406, with a single machine-gun in each wing, and after evaluation during 1938 a total of 955 were ordered. Construction was carried out by the Ouest, Midi and Centre divisions of SNCA (Société Nationale de Constructions Aéronautiques, the nationalized French aircraft industry) as well as by Morane-Saulnier. However, by September 1939 only 572 had been delivered.

The total had risen to 961 by the end of the year and 1098 by the time of the French surrender in June 1940, which included a number built for export but not delivered. Finland and Turkey each received the 30 they had ordered, but the first 50 of a Polish order for 160 were still in transit when that country was occupied by Germany in September 1939. Another 12 for China were taken over by the French on their arrival in Indo-China; 13 for Lithuania and 20 for Yugoslavia were not delivered.



The MS.406 equipped four Groupes de Chasse in France at the start of World War II, and during the months of preliminary skirmishing a number of deficiencies became apparent, particularly in the matter of armament, which proved too light and prone to failure. A few were modified to MS.410 standard with an extra pair of guns. Although the 406 was numerically the most important French fighter, its combat record was poor and by the Armistice it was being replaced by other fighters. The Germans transferred 20 MS.406s to Finland and 36 to Croatia after the occupation.

MS.406

Type: monoplane fighter
Maker: Morane-Saulnier; Société Nationale de Constructions Aéronautiques
Span: 10.61 m (34 ft 9¾ in)
Length: 8.17 m (26 ft 9¾ in)
Height: 3.25 m (10 ft 8 in)
Wing area: 16 m² (172.23 sq ft)
Weight: loaded 2540 kg (5600 lb); empty 1895 kg (4178 lb)
Powerplant: one 860-hp Hispano-Suiza 12Y-31 V-12 liquid-cooled engine
Performance: maximum speed 490 km/h (304.5 mph) at 4500 m (14 764 ft); range 720 km (447 miles); operational ceiling 10 000 m (32 808 ft)
Armament: one 20-mm (0.79-in) Hispano-Suiza cannon; two 7.5-mm (0.295-in) MAC machine-guns
Crew: 1
Production: 1098 (all types)

C.714, Caudron

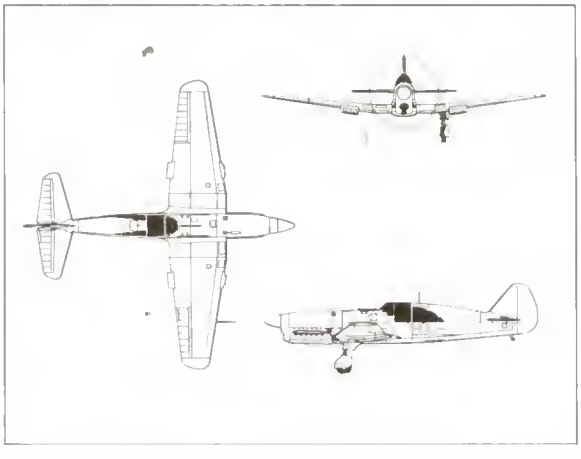
FIRST FLIGHT 1938

Left: One of the Finnish Caudron C.714s; though 50 were sent only six arrived to see action
Below and below left: The C.714 required only 5000 man-hours in its construction but though it also used non-strategic materials the Armée de l'Air decided that its performance was inadequate. Despite this a Polish unit scored some successes during air actions around Paris in 1940

THE Caudron-Renault racers that competed in the French Coupe Deutsch de la Meurthe air races in the early 1930s inspired a whole series of experimental military aircraft characterized by extreme lightness. The C.690 trainer, with a 240-hp Renault six-cylinder inline, was followed in 1936 by the C.710 prototype fighter, powered by a 450-hp Renault 12 RoI. Both of these had fixed landing gear, but the C.713, first flown in December 1937, introduced retractable landing gear. By the following September further refinement had produced the C.714.

This was tested by the Armée de l'Air in the autumn of 1938, and 100 production aircraft were ordered. A great attraction of the type was the primarily wooden construction which required only a minimum of building time. A second order followed for a similar quantity of export aircraft intended for Finland and Yugoslavia, but the Armée de l'Air reconsidered its decision and cancelled its order on the grounds of poor climb-rate.

Meanwhile, a 730-hp Isotta-Fraschini Delta RC40 had been installed in the further revised C.715, subsequently re-designated CR.760, which added a further pair of machine-guns to the four 7.5-mm (0.295-in) weapons carried by the C.714. Two prototypes were tested in early 1940, while a third was given an 800-hp Renault 626 inverted-vee 16-cylinder engine as the CR.770. This was flown briefly in May 1940, but proved to have a faulty engine installation. The projected CR.780, intended to have a 500-hp Renault 468, was never built. These lightweight fighters had shown great promise before the abandonment of the programme, the CR.760 having proved extremely manoeuvrable and reached 540 km/h (335.5 mph) at 5000 m (16 404 ft).



However, production of the C.714 had gone ahead on the strength of a revised order from Finland for 70, though only six had reached Finland when the Winter War against the Soviet Union ended in March 1940. A number were also acquired by the Armée de l'Air, which had received 47 by the beginning of March. These were issued to a Polish unit, GC I/145, assigned to the defence of Paris, and on June 2, 1940, the squadron claimed two Bf 109s shot down. More successes were achieved in the next few days, before the survivors were abandoned as unserviceable.

C.714

Type: lightweight fighter
Maker: Avions Caudron-Renault
Span: 8.95 m (29 ft 4½ in)
Length: 8.53 m (27 ft 11¾ in)
Height: 2.87 m (9 ft 5 in)
Wing area: 12.5 m² (134.55 sq ft)
Weight: loaded 1750 kg (3858 lh); empty 1400 kg (3086 lb)
Powerplant: one 450-hp Renault 12 RoI inverted V-12 air-cooled engine
Performance: maximum speed 490 km/h (304.5 mph) at 4000 m (13 123 ft); range 900 km (559 miles); operational ceiling 9100 m (29 856 ft)
Armament: four 7.5-mm (0.295-in) MAC 1934 M39 machine-guns
Crew: 1
Production: approx 150 completed

D.520, Dewoitine

FIRST FLIGHT 1938

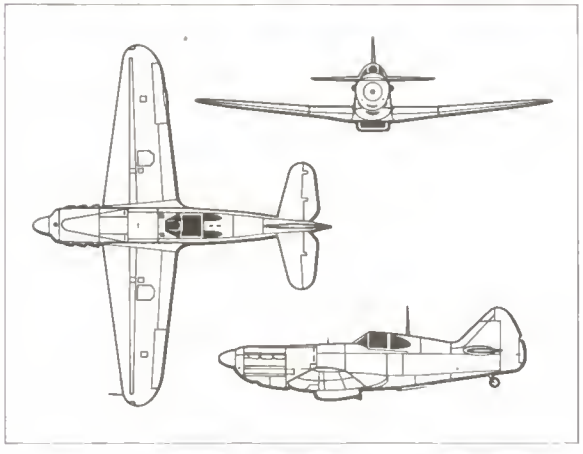
Left: A Dewoitine D.520 of SPA 124; by the end of the fighting in 1940 French units had 114 confirmed kills and 39 probables
Below left: A Free French D.520; they were used against retreating German units and pockets of troops
Below: A D.520 in an unusual mottled camouflage. The fighter saw action in the hands of both Allied and Axis pilots

WHEN the D.513 had proved inferior to the prototype of the Morane-Saulnier MS.405, Emile Dewoitine's design bureau began work on a new fighter, the D.520 (the designation reflecting the speed of 520 km/h (323 mph) required by the air ministry and embodied in a January 1937 specification). In March 1937 Dewoitine joined SNCA du Midi, where work was continued, and by the time a government contract was placed in April 1938, the prototype D.520 was nearing completion.

Its first flight came in October 1938, a second prototype appeared in January 1939 and a third flew in March 1939, shortly before the first of a total of 1280 production aircraft were ordered. By April 1940 the quantity had been increased to 2320, including 120 for the Aéronavale, to be delivered at a rate of 350 per month. The production aircraft were longer than the prototypes and carried four instead of two 7.5-mm (0.295-in) machine-guns in the wings.

Unfortunately, a number of problems were experienced with the first production D.520, flown in November 1939: only 13 had been delivered by the end of the year, and it was not until April 1940 that a hasty modification programme had cured all the faults. The result was that D.520s were operational with only one Groupe de Chasse on May 10, when the westward German advance began, though by June 25, with 437 machines completed, four more Groupes had begun operations and another two were in the process of conversion to the new fighter.

The armistice was not the end of the D.520's career. Four Groupes de Chasse and two Aéronavale squadrons of the Vichy air forces operated the type in North Africa, and in mid 1941 production of the type was resumed by SNCASE, another 349 being completed, 197 of them with 12Y-49 engines. Further units were equipped with them, and many saw action against the RAF in North Africa and Syria in 1941–42. In March 1943 the Germans occupied the remainder of France, and the D.520 was taken over by Luftwaffe training units, some serving on the Eastern Front and others being allocated to Italy, Romania and Bulgaria. Another change of side came in 1944, when French units were formed to fight in support of the re-occupying Allies, and some remained in service as dual-control trainer conversions until 1953.



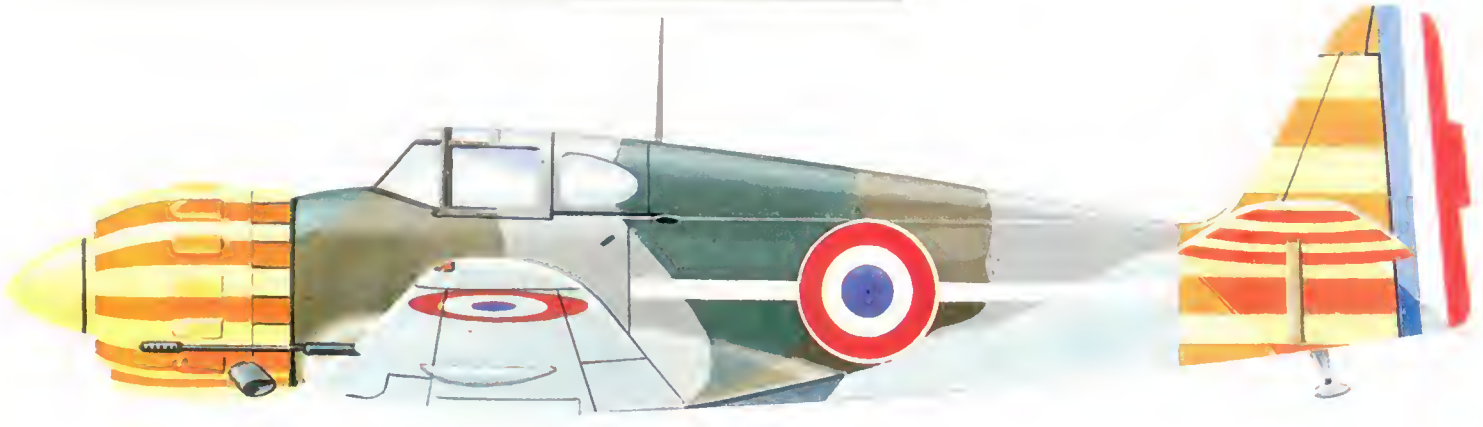
D.520

Type: monoplane fighter
Maker: Société Nationale de Constructions Aéronautiques du Midi, de Sud-Est
Span: 10.2 m (33 ft 5½ in)
Length: 8.76 m (28 ft 8¾ in)
Height: 2.57 m (8 ft 5 in)
Wing area: 15.95 m^2 (171.69 sq ft)
Weight: loaded 2676 kg (5900 lb); empty 2092 kg (4612 lb)
Powerplant: one 920-hp Hispano-Suiza 12Y-45, or 910-hp 12Y-49, V-12 liquid-cooled engine
Performance: maximum speed 535 km/h (332.4 mph) at 5500 m (18 045 ft); range 890 km (553 miles); operational ceiling 11 000 m (36 089 ft)
Armament: one 20-mm (0.79-in) Hispano-Suiza HS 404 cannon; four 7.5-mm (0.295-in) MAC machine-guns
Crew: 1
Production: 786

Bloch 152

FIRST FLIGHT 1938

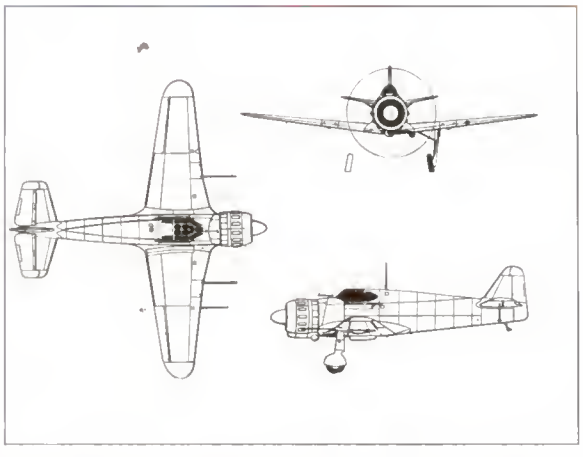
Left: The Bloch MB-151 No 1, the first pre-production machine with close-fitting cowling
Below: An MB-152 in Vichy markings; there were six Groupes de Chasse in unoccupied France equipped with the MB-151 and MB-152. Some 95 machines were modified with long-range tanks to enable them to escape to North Africa – but the plan was discovered by the German monitoring teams



THE air ministry specification of July 1934, which gave rise to the Morane-Saulnier MS.405 and 406 resulted in a number of other prototypes, among them the Marcel Bloch 150. Powered by a 930-hp Gnome-Rhône 14Kfs radial and armed with two wing-mounted HS 404 cannon, the 150 was abandoned after proving unable to take off in July 1936. However, the design was revised during 1937, and with new wings, engine and landing gear the prototype finally flew in September of that year. Performanec was modest, but with the Armée de l'Air desperately short of modern fighters three new prototypes using more powerful engines were requested.

The first prototype 151 to fly, with an 870-hp Gnome-Rhône 14N11 and four wing-mounted machine-guns, was one of the pre-production batch, and its first flight in August 1938 was followed in December by that of the first prototype 152. Overheating limited its 1000-hp Gnome-Rhône 14N25's speed to under 500 km/h (311 mph). The second prototype, designated Bloch 153, used a Pratt & Whitney Twin Wasp and flew in April 1939, but the planned Wright Cyclone-powered 154 was never completed.

Deliveries did not begin until the spring of 1939, and although the orders were increased on the outbreak of war, control problems and lack of parts, usually from sabotage, delayed their service introduction, and many of the 151s were relegated to training duties. The 151 order was completed in early 1940, but further modifications were considered necessary before the 152s were considered suitable for operational service: orders were reduced again, some being amended to cover a new development, the Bloch 155, which had increased fuel capacity and extra pair of machine-guns. The 157 had the exceptional speed of 709 km/h (441 mph).



Deliveries by the time of the armistice totalled 699, comprising 60 151s, and 639 152s, in addition to the single 153 and nine 155s. In action the 152 proved extremely tough, with amazing ability to survive battle damage. It was sweet to handle, had outstanding manoeuvrability and could even overtake a Bf 109E in a dive. It was also a very steady gun platform. In 1942 the Germans discovered a plan to fit long-range tanks to allow 152s to escape to North Africa.

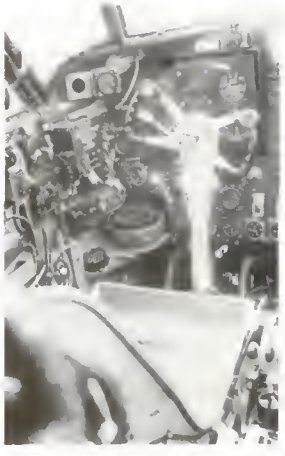
Bloch 152

Type: monoplane fighter
Maker: Société Nationale de Constructions Aéronautiques de Sud-Ouest
Span: 10.54 m (34 ft 7 in)
Length: 9.1 m (29 ft 10¼ in)
Height: 3.03 m (9 ft 11¼ in)
Wing area: 17.32 m² (186.44 sq ft)
Weight: maximum 2800 kg (6172 lb); empty 2103 kg (4636 lb)
Powerplant: one 1000-hp Gnome-Rhône 14N25 14-cylinder two-row radial
Performance: maximum speed 515 km/h (320 mph) at 4000 m (13 129 ft); range 580 km (360 miles); operational ceiling 10 000 m (32 808 ft)
Armament: two 20-mm (0.79-in) Hispano-Suiza HS 404 cannon; two 7.5-mm (0.295-in) MAC machine-guns
Crew: 1
Production: 639

Blenheim IF, Bristol

FIRST FLIGHT 1935

Left: An AI-equipped Blenheim IF night-fighter of No 614 Squadron. Blenheim bombers were converted using a gun pack built by Southern Railways Ashford factory. With this installation they were known as IF – interim fighters
Below left: The bomber prototype which was as fast as contemporary fighters and had the popular name of *Britain First*
Below: The pilot's position in the bomber. With the gun and radar installation it became the first British night-fighter

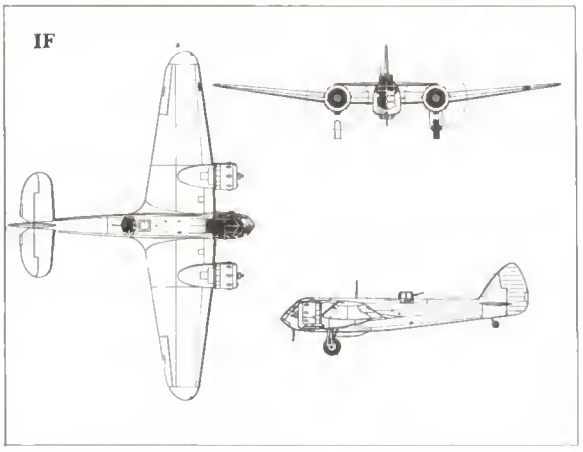


IN 1938 it was decided to convert a number of Type 142M Blenheims as Mk IF long-range and night-fighter – a class of aircraft entirely absent from the RAF's procurement plans – by adding ventral gun packs containing four 0.303-in (7.7-mm) Browning machine-guns with 500 rounds of ammunition for each gun.

The packs, complete with magazines were subcontracted to the Southern Railway workshops at Ashford, Kent, and were carried in addition to the standard bomber armament of one forward-firing Browning in the left wing, and a Vickers K in a retractable dorsal turret. The 200 Blenheims converted in this way equipped a total of 11 home and three overseas fighter squadrons during the early stages of World War II, until their replacement by the Bristol Beaufighter.

The Blenheim was the first night-fighter ever equipped with the British invention of AI (Airborne Interception) radar. It was the only fighter available with room for the bulky and temperamental equipment and its operator, a third crewmember. The first installations, of AI Mk III sets, were made in July 1939. The plan was that Blenheims would be directed to the general vicinity of hostile aircraft detected by ground radar stations, at which point the airborne radar would take over for the final stages of the interception.

The reality was rather different. For a start, the positions supplied by the ground controllers were inevitably imprecise, while ground interference tended to obscure the image received by the AI set, whose range was thus limited to a distance equivalent to the aircraft's height. Even worse, because of interference from the transmitting aerial, the minimum effective range was around 1.6 km (1 mile), which was of little use in darkness. A great improvement was made with the AI Mk IV set, which had a minimum effective range of 336 m (1100 ft), but the Blenheim was in any case poorly armed and too slow to have much chance of catching an intruder. The first operational kill using AI radar was made in July 1940 by a Blenheim of the experimental Fighter Interception Unit, but there were not many more. Some Blenheim IVs were also fitted with dorsal gun packs and, after brief service as interceptors, were passed to Coastal Command for use against shipping.



Blenheim IVF

Type: long-range and night-fighter
Maker: Bristol Aeroplane Co
Span: 17.17 m (56 ft 4 in)
Length: 12.98 m (42 ft 7 in)
Height: 3.05 m (10 ft)
Wing area: 43.57 m^2 (469 sq ft)
Weight: maximum 6580 kg (14 500 lb); empty 4173 kg (9200 lb)
Powerplant: two 920-hp Bristol Mercury XV 9-cylinder air-cooled radials
Performance: maximum speed 418 km/h (260 mph) at 3658 m (12 000 ft); range 2350 km (1460 miles); operational ceiling 7498 m (24 600 ft)
Armament: five 0.303-in (7.7-mm) Browning machine-guns; one or two 0.303-in Vickers K machine-guns
Crew: 2 to 3
Production: 3983

G.1, Fokker

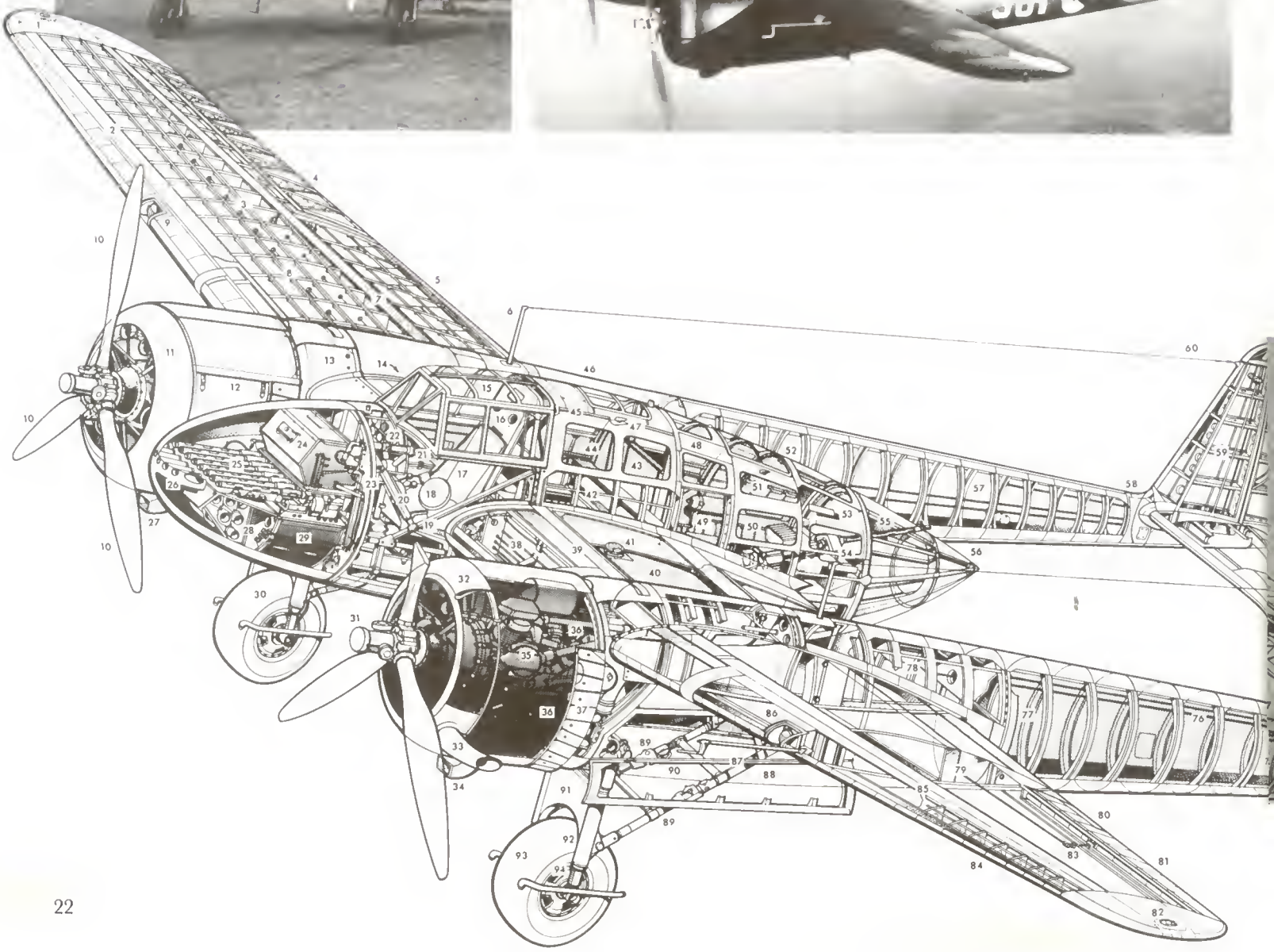
FIRST FLIGHT 1937

DESIGNED and built in secrecy, and transported to France by boat, the Fokker G.1 was officially unveiled by its manufacturers at the Paris Air Show of November 1936, where its novel configuration aroused considerable interest. A central nacelle housed the pilot and rear gunner, plus the armament of two 23-mm (0.91-in) cannon and two 7.92-mm (0.312-in) machine-guns in the nose and a third machine-gun on a flexible mount aft. The two engines were 750-hp Hispano-Suiza 80-02 radials, and the horizontal tail was carried on booms and incorporated a single tailwheel. Provision for a 400-kg (882-lb) bombload, and for a radio operator to be carried in place of the fuselage fuel tank, gave the aircraft a multirole capability.

The G.1's first flight was made in March 1937 and test flights proved satisfactory, but after a demonstration the following month the Dutch army air service asked for a number of modifications. The principal change requested was to the engines, as standardization was desirable. The prototype was re-engined with 750-hp Pratt & Whitney Twin Wasp Juniors later in 1937, becoming the G.1b, and in November the army air service ordered 36 G.1as, to be of increased overall dimensions, with two Bristol Mercury VIII engines and a revised armament of eight nose and one tail machine-guns, plus a radio operator.

Deliveries began in October 1938. The fourth aircraft had a glazed gondola in place of the bomb bay under the crew nacelle, but this was not adopted and Dornier Do 215s were ordered from

Below left: The first prototype Fokker G.1 which was later rebuilt as a G.1b for the Spanish government but never exported
Below: The first production G.1a in army air force insignia
Below right: A rear view showing the tailcone position. It housed a single machine-gun which was operated by the radio operator. One machine was also fitted with an experimental observation cupola beneath the fuselage

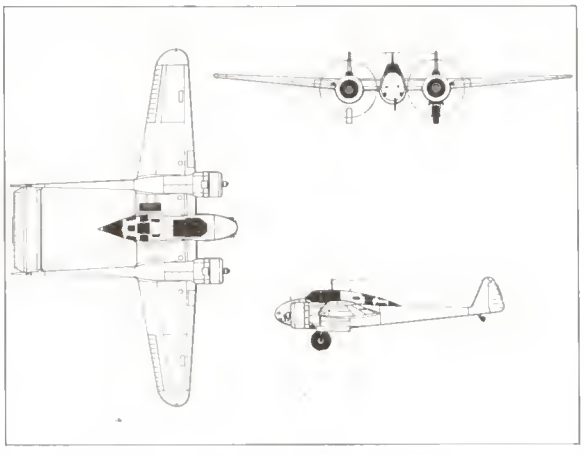


Germany (though never delivered) to fulfil the reconnaissance role. Another 1a had hydraulically operated dive brakes under the outer wings.

Meanwhile, foreign interest in the G.1 had led to the development of the Twin Wasp Junior G.1b, closely based on the original prototype, whose design was finalized in early 1939. The first order, from the Spanish Republicans, was embargoed by the Dutch government (Estonia tried desperately to buy the same aircraft and may have been acting as a Spanish agent), where they were to be fitted with 20-mm (0.79-in) Oerlikon cannon; Sweden ordered 18, with Bofors cannon and machine-guns; and licence production was planned in Denmark. By late 1939 all the 'Estonian' G.1bs had been test-flown, but the two 23-mm Madsen cannon (plus two 7.92-mm FN) were absent from their noses.

On May 10, 1940, when the German invasion began, 23 G.1as were airworthy with the 3rd and 4th Fighter Groups of the 1st Air Regiment, another two having been lost previously. Most were destroyed on the ground, but the former unit succeeded in destroying 14 German bombers on the first day of fighting. Three of the G.1bs were given an armament of four machine-guns.

Before the war ended further development there had been plans to exploit the design's multirole potential. A mock-up was prepared of the four-man G.2, to combine the fighter, bomber and reconnaissance functions; another derivative, the T-6 bomber, would have had an enlarged nacelle with a glazed nose, but German occupation halted progress with these designs.

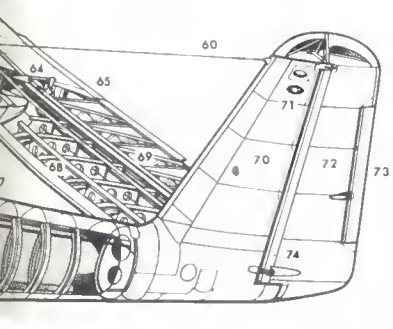


G.1a

Type: heavy fighter and close-support aircraft
Maker: NV Vliegtuigenfabriek Fokker
Span: 17.15 m (56 ft 3 in)
Length: 11.5 m (37 ft 8¾ in)
Height: 3.4 m (11 ft 1¾ in)
Wing area: 38.3 m² (412.2 sq ft)
Weight: loaded 4800 kg (10 582 lb); empty 3360 kg (7407 lb)
Powerplant: two 830-hp Bristol Mercury VIII 9-cylinder air-cooled radials
Performance: maximum speed 475 km/h (295 mph); range 1410 km (876 miles); operational ceiling 9300 m (30 512 ft)
Armament: nine 0.312-in (7.92-mm) FN-Browning machine-guns; 400 kg (880 lb) of bombs
Crew: 2 to 3
Production: 36

G.1

1 Right navigation light*
2 Forward spruce-and-ply mainspar
3 Plywood former ribs
4 Fabric-covered welded steel-tube aileron (statically and dynamically balanced)
5 Hydraulically-operated duralumin landing flap
6 Right aerial mast
7 Rear mainspar
8 Control runs
9 Right landing light
10 Three-blade Hamilton Standard two-piston airscrew
11 Cowling spring
12 Nacelle panel quick-release catches
13 Duralumin boom skinning
14 Right fuel tank
15 Centre-hinged canopy roof
16 Pilot's headrest
17 Pilot's adjustable seat
18 Circular vision port
19 Welded chrome-molybdenum steel tube forward fuselage structure
20 Throttle controls
21 Control column
22 Instrument panel
23 Forward bulkhead
24 Ammunition tank (4000 rounds)
25 Battery of eight 7.9-mm (0.311-in) FN-Browning M-36 machine-guns
26 Gun ports
27 Carburettor air intake
28 Gun support frame
29 Case collector box
30 Right mainwheel
31 Airscrew pitch-control mechanism
32 Exhaust collector ring
33 Exhaust pipe
34 Carburettor air intake
35 Bristol Mercury VIII air-cooled radial engine
36 Engine bearers
37 Controllable cooling gills
38 Mainspar inboard section (integral with fuselage nacelle)
40 Left fuel tank
41 Fuel filler cap
42 Rear spar carry-through
43 Aft bulkhead
44 Centre fuselage (accommodating radio equipment)
45 Plywood monocoque fuselage nacelle centre section
46 Right tailboom
47 Hinged entry hatch
48 Duralumin rear fuselage construction
49 Rear gunner's couch
50 Gimbal-suspended 7.9-mm (0.311-in) FN-Browning M-36 machine-gun
51 Ammunition racks
52 Hinged entry hatch
53 Handholds
54 Gun support bar
55 Inward-hinged tailcone section
56 Perspex tailcone
57 All-metal monocoque tailboom structure
58 Tailboom/fin fairing fillet
59 Integral duralumin tailfin structure
60 Aerials
61 Welded chrome molybdenum steel-tube fabric covered rudder
62 Rudder tab
63 Fabric-covered steel-tube elevator
64 Elevator hinge fairing
65 Elevator tab
66 Tailwheel leg fairing
67 Swivelling tailwheel
68 Dural tailplane structure (duraplat sheet skinning)
69 Steel-tube elevator structure (fabric skinning)
70 Duraplat tailfin skinning
71 Tail navigation light
72 Left rudder
73 Rudder tab
74 Rudder hinge fairing
75 Metal monocoque tailboom construction
76 Control runs
77 Bolted joint between wooden (integral with wing centre section) and duralumin monocoque tailboom portions
78 Wooden tailboom strujcture
79 Wing rearspar
80 Aileron tab (left side only)
81 Left aileron (fabric-covered welded steel-tube)
82 Left navigation light
83 Aileron control linkage
84 Leading-edge construction
85 Forward spruce-and-ply mainspar
86 Left landing light
87 Pitot tube
88 Mainwheel doors
89 Mainwheel retraction members
90 Mainwheel well
91 Mainwheel leg cover plate
92 Mainwheel leg
93 Left mainwheel
94 Shock absorbers



Gladiator, Gloster

FIRST FLIGHT 1934

THE 1930 Air Ministry specification for a 402-km/h (250-mph) four-gun fighter anticipated trials of the resulting aircraft taking place in 1932. Unfortunately for a number of firms which responded quickly the recommended powerplant (the steam-cooled Rolls-Royce Goshawk) proved a failure, and the trials were postponed repeatedly.

This worked to the advantage of Gloster, which was too busy with the Gauntlet to respond to the new specification until 1933, when it was decided to develop the Gauntlet to meet the requirement. Strengthened single-bay wings, a single-strut landing gear with Dowty internally-sprung wheels, and a more powerful Bristol Mercury engine were expected to provide the necessary improvement in performance. The armament requirement was met by adding to the two Vickers on the fuselage sides a pair of drum-fed Lewis guns in fairings under the lower wings. The prototype, designated SS.37, flew in September 1934, and with a 645-hp Mercury VIS was subjected to official trials the following year. It was selected for production as the Gladiator in July 1935.

Production Gladiators featured an enclosed cockpit and four belt-fed Browning machine-guns. Deliveries did not begin until early 1937. Nevertheless, delays in the supply of more modern fighters led to the last two dozen of the 231 Gladiator Is that had been ordered being modified to Mk II standard, and another 350 Mk IIs being ordered. The main change was the replacement of the Mk I's 840-hp Mercury IX by an 890-hp Mercury VIIIA. By this time the Royal Navy had selected the Gladiator as a replacement for the Hawker Nimrod, and 98 Gladiator IIs were completed as Sea Gladiators with arrester hooks, ventral dinghy and other naval equipment.

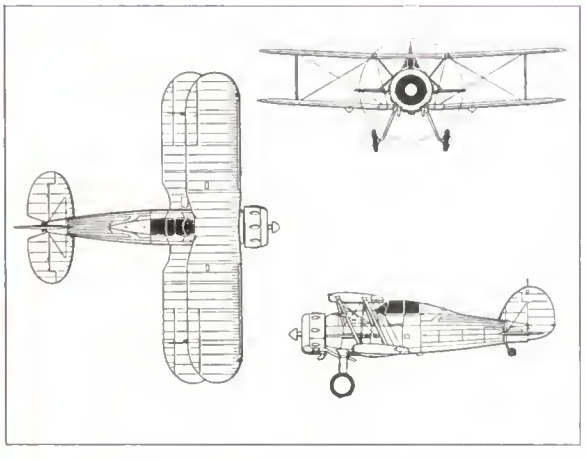
Despite its obsolescence, it saw combat on almost every front during the first two years of World War II, and won an enduring reputation.

Gladiators saw their first action in 1938, with the Chinese air force and with the RAF in Palestine. Two of the AAF squadrons went to France towards the end of 1939, where their aircraft were lost or destroyed, like the Belgian Gladiators, in the face of the German invasion of May 1940. The previous month, Gladiators had taken part in the resistance to the invasion of Norway, the RAF's 163 Squadron achieving fame for its attempts to operate the fighter from the frozen Lake Lesjaskogsvatn after flying in from HMS *Glorious*.

Subsequent action for the type came in the contrasting conditions prevailing in the Mediterranean, the Middle East and North and East Africa, with Australian and South African units.

Although home-based Gladiators had been relegated to second-line duties by the end of 1940, a few of the naval version remained in service aboard HMS *Courageous* and *Eagle* until 1941. It was the Sea Gladiators that provided the most famous individual examples. In June 1940, four Sea Gladiators were assembled from crated, spare airframes on Malta. For three weeks, with only three of the fighters serviceable at any one time, they provided the island's only fighter defences, becoming known in the process as *Faith, Hope* and *Charity*.

Above: The third of the first batch of 23 production aircraft in 1936
Right: A briefing for Fleet Air Arm pilots on the wing of a Sea Gladiator
Centre: A Gladiator banks to the right, with full 'top rudder'. The cockpit position gave the pilot fair visibility
Far right: A pre-war Gladiator patrols the Suez Canal – its serial number has been deleted by the censor
Top right: The Gladiator has the distinction of being the last biplane fighter to serve in the RAF



Gladiator II

Type: biplane fighter
Maker: Gloster Aircraft Co Ltd
Span: 9.83 m (32 ft 3 in)
Length: 8.36 m (27 ft 5 in)
Height: 3.23 m (10 ft 7 in)
Wing area: 30.01 m^2 (323 sq ft)
Weight: loaded 2206 kg (4863 lb); empty 1745 kg (3847 lb)
Powerplant: one 890-hp Bristol Mercury VIIIA 9-cylinder air-cooled radial
Performance: maximum speed 414 km/h (257 mph) at 4450 m (14 600 ft); range 715 km (444 miles); operational ceiling 10 211 m (33 501 ft)
Armament: four 0.303-in (7.7-mm) Browning machine-guns
Crew: 1
Production: 768 (all types)

Fulmar, Fairey

FIRST FLIGHT 1940

IN late 1937, delays in the development of the Blackburn Roc led the Royal Navy to seek another fighter. The prime requirements were accommodation for a radio operator and long range, rather than speed, as its duties were expected to be restricted to escorting strike aircraft and dealing with enemy reconnaissance aircraft.

The Fairey P.4/34 light bomber proved readily adaptable to the Royal Navy's purpose. Among the changes needed for naval operations were an increase in fuel capacity to provide the necessary range, the addition of catapult hooks and an arrester hook, and wing-folding mechanism.

The powerplant remained a Rolls-Royce Merlin and armament was to be the new standard of eight 0.303-in (7.7-mm) machine-guns: the prototype bombers had their bomb racks buried in the wings, so accommodation was readily available for the guns and a generous 750 rounds of ammunition for each.

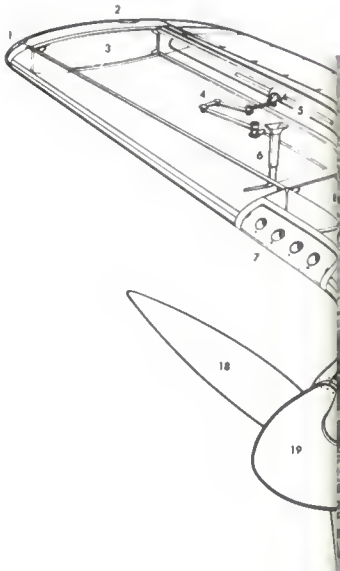
One of the two P.4/34s was converted to become the prototype of the new fighter, and with the name Fulmar the first production example made its maiden flight in January 1940. Performance with a 1060-hp RM3M (modified Merlin III) was not encouraging, the maximum speed achieved on official trials being 411 km/h (255.4 mph) at 732 m (2400 ft). Climb rate and ceiling were equally disappointing, but handling and manoeuvrability were good, and by April the first Merlin III-powered production Fulmar had been completed. By the end of 1940, 159 had been delivered, and

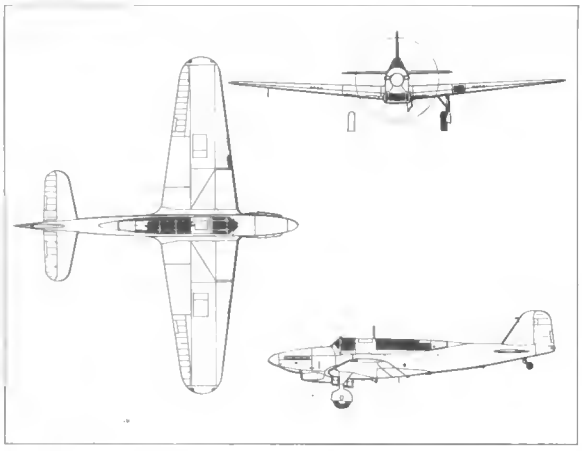
Above: The Fulmar with its long greenhouse canopy proved to be slow and vulnerable to attack from the rear. However in more specialized roles, such as night intrusion and Airborne Interception radar training, it enjoyed some success. It also did well against Italian aircraft

Above right: A Fulmar II in April 1942; this aircraft is armed with eight machine-guns, but some machines received heavier guns for attacking the larger German bombers

Fulmar I

1 Right navigation light
2 Deck-handling hold
3 Right wingtip
4 Aileron control linkage
5 Aileron torque tube
6 Underwing pitot head
7 Right wing gun ports
8 Aileron control rod
9 Wing rib
10 Right aileron
11 Aileron trim tab
12 Right flap
13 Flap operating mechanism
14 Trailing-edge wing-fold mechanism
15 Wing-fold hinge line
16 Camera gun access
17 Camera gun left
18 Three-blade Rotol constant-speed propeller
19 Spinner
20 Coolant header tank
21 1080-hp Rolls-Royce Merlin VIII engine
22 Coolant pipes
23 Ejector exhaust mainifold
24 Engine bearing frame support
25 Engine accessories
26 Propeller speed control unit
27 Engine bearer strut
28 Oil/coolant intake
29 Right mainwheel fairing
30 Right mainwheel
31 Carburettor air intake
32 Intake duct
33 Oil radiator (centre)
34 Coolant radiators (left and right)
35 Firewall bulkhead
36 Rudder pedal mounting
37 Control column
38 Exhaust glare shield
39 Oil tank
40 Windscreen
41 Reflector gunsight
42 Rear-view mirror
43 Aft-sliding cockpit canopy
44 Sling shackle
45 Pilot's fire extinguisher (hand-held)
46 Pilot's seat
47 Seat harness
48 Arrester hook release
49 Underfloor control linkage
50 Fuselage/main spar attachment
51 No 1 fuselage frame
52 Transmitter/receiver
53 Accumulator
54 Dry battery
55 Canopy track
56 Receiver
57 Fuselage fuel tank
58 Hydraulic header tank
59 Aerial mast
60 Observer's auxiliary instrument panel (ASI/altimeter)
61 ARI.5003 indicator
62 Indicator cradle
63 Fire extinguisher
64 Sliding chart table
65 Oxygen cylinders, (left and right)
66 Observer's swivel seat
67 Oxygen supply tube
68 ARI.5003 transmitter unit
69 Compass mounting
70 Compass
71 Observer's canopy section (forward-sliding)
72 Fixed aft canopy
73 Dorsal identification light
74 Aerial lead-in
75 Break-out window panels
76 Signalling lamp stowage
77 Signal cartridge stowage
78 CO_2 cylinder (dinghy inflation)
79 First-aid kit
80 Dinghy stowage
81 Jettisonable panel
82 Aerials
83 Aft canopy fairing
84 Right tailplane
85 Right elevator
86 Elevator trim tab
87 Fin leading edge
88 Fin structure
89 Rudder trim tab control
90 Rudder upper hinge
91 Rudder frame
92 Rudder trim tab
93 Rear formation light
94 Rear navigation light
95 Tail cone
96 Rudder lower hinge
97 Aft fuselage frame (No 22)
98 Rudder pivot
99 Elevator cross-shaft control
100 Elevator trim tab
101 Elevator frame
102 Tailplane structure
103 Fixed tailwheel
104 Tailwheel shock-absorber
105 Fuselage frame (No 20)/tailfin attchment
106 Rudder cables
107 Dinghy release cord (external)
108 Fuselage structure
109 Elevator cables
110 Arrester hook tunnel
111 Arrester hook
112 Catapult spool
113 Arrester hook pivot
114 Arester hook shock-absorbing damper
115 TR.1133/1143 aerial
116 Sea marker flares/smoke-float chute
117 Flare/float chute
118 Entry foot/handholds
119 Aft cockpit floor level
120 Wingroot fillet
121 Flap section
122 Flap structure
123 Left aileron trim tab
124 Aileron frame
125 Deck-handling hold
126 Left navigation light
127 Outer wing ribs
128 Rear spar
129 Forweard spar
130 Leading-edge ribs
131 Four 0.303-in (7.7-mm) Browning machine-guns
132 Machine-gun barrels (blast tubes omitted)
133 Gun ports
134 Diagonal bracing ribs
135 Ammunition box stowage
136 Strengthened wing rib (No 10)
137 Diaphragms
138 Outer wing (hinge) diagonal frame
139 Stringers
140 Rear spar attachment
141 Inboard rib
142 Intermediate (oinboard) strut
143 Landing gear retraction link
144 Left mainwheel well
145 Radiator shutters
146 Mainwheel inner fairing
147 Rib cut-outs
148 Landing gear catch/lock
149 Landing gear pivot
150 Toggle spring
151 Retraction lever
152 Wing hinge
153 Landing gear rear bearing strut
154 Landing lamp
155 Mainwheel leg outer cylinder
156 Side bracing
157 Mainwheel leg fairing
158 Sliding member
159 Mainwheel fairing
160 Left mainwheel





Fulmar II

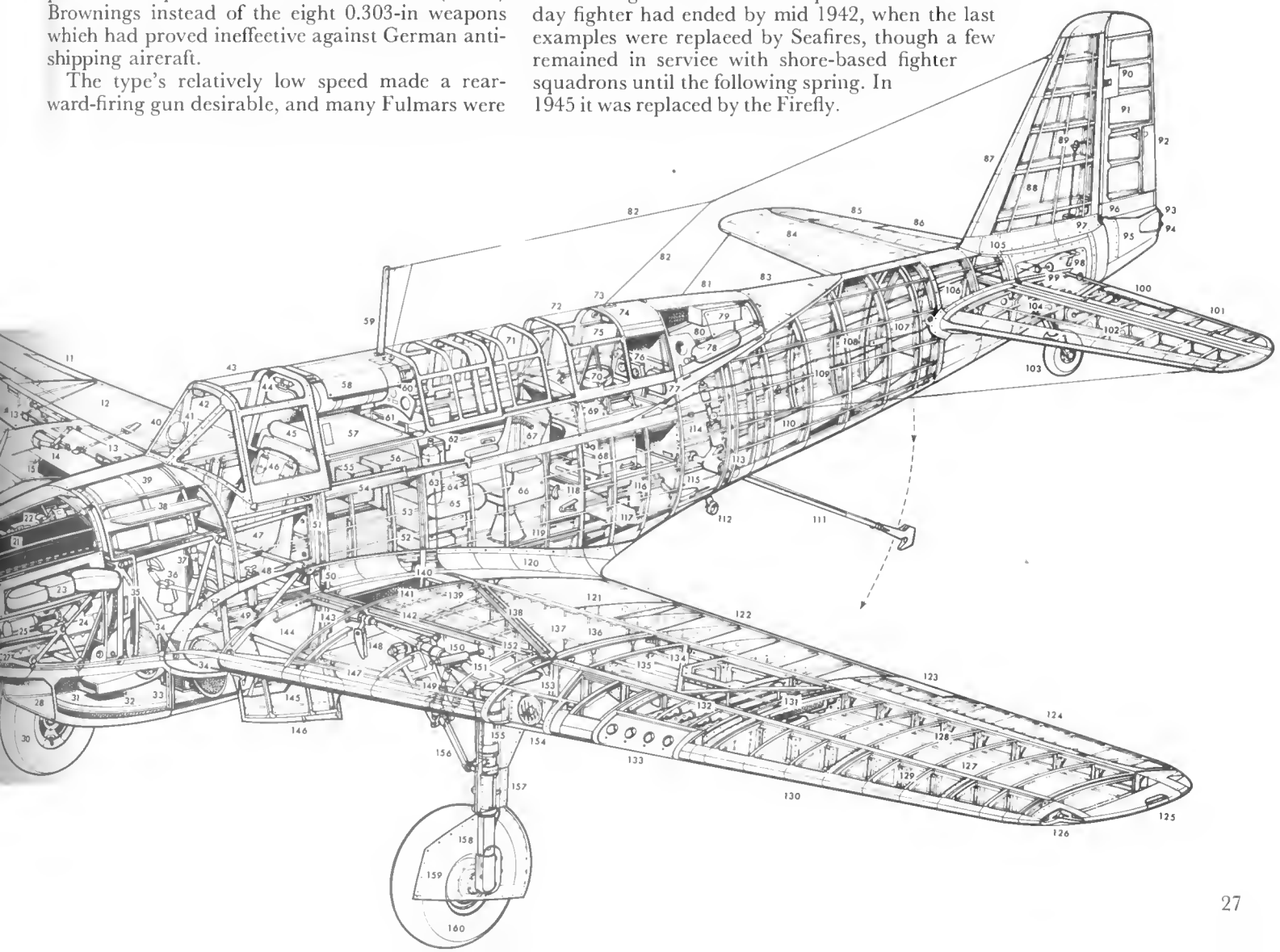
Type: shipboard fighter
Maker: Fairey Aviation Ltd
Span: 14.14 m (46 ft 4¾ in)
Length: 12.24 m (40 ft 2 in)
Height: 4.3 m (14 ft 1¼ in)
Wing area: 31.77 m² (342 sq ft)
Weight: loaded 4387 kg (9672 lb); empty 3924 kg (8651 lb)
Powerplant: one 1300-hp Rolls-Royce Merlin 30 V-12 liquid-cooled engine
Performance: maximum speed 438 km/h (272 mph) at 2210 m (7251 ft); range 1255 km (780 miles); operational ceiling 8291 m (27 201 ft)
Armament: eight 0.303-in (7.7-mm) Browning and one 0.303-in Vickers K machine-guns; light bombs
Crew: 2
Production: 602 (both models)

one of these had been completed as a Fulmar II, with 1300-hp Merlin 30 engine and a 159-kg (350-lb) reduction in maximum weight. These changes resulted in a slightly improved level speed and a considerably better rate of climb, so from the beginning of 1941, production switched to the Mk II, almost 450 of this model being built out of a production total of 602. Approximately 100 of these were converted to the night-fighter role, with Airborne Interception radar, and others were completed with provision for four 12.7-mm (0.5-in) Brownings instead of the eight 0.303-in weapons which had proved ineffective against German anti-shipping aircraft.

The type's relatively low speed made a rearward-firing gun desirable, and many Fulmars were so fitted with a pillar-mounted machine-gun, while most Mk IIs had provision for a drop-tank or light bombload to be carried under the fuselage.

The first Fulmars to enter service joined 806 Squadron in June 1940, and the type eventually equipped 14 first-line squadrons. It served aboard the aircraft carriers *Illustrious, Ark Royal, Formidable, Victorious, Argus, Furious* and *Indomitable*, on Fighter Catapult Ships and various shore stations.

The night-fighter conversions were used mainly for training. The Fulmar's shipboard service as a day fighter had ended by mid 1942, when the last examples were replaced by Seafires, though a few remained in service with shore-based fighter squadrons until the following spring. In 1945 it was replaced by the Firefly.



Defiant, Boulton Paul

FIRST FLIGHT 1937

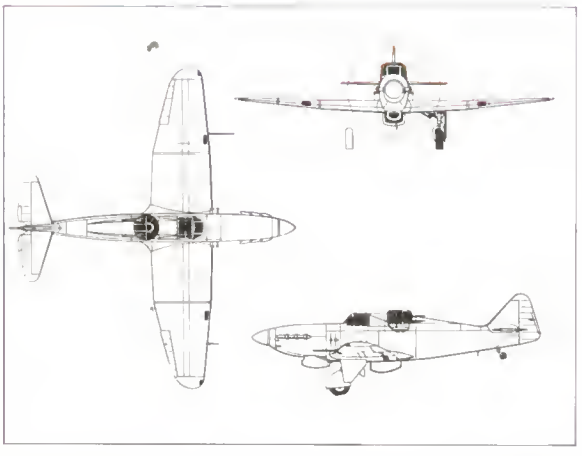
Far left: The Defiant as a day fighter – in this role over Dunkirk it shot down a claimed 65 enemy aircraft in 19 days
Left: A Mk II fitted with radar for night-fighting. It had the highest number of night kills of any type in the winter of 1940–41. The turret-mounted guns were intended to give a concentrated burst of fire as the aircraft flew parallel with its target
Below: The Mk I Defiant of the CO of the first squadron, No 264, December 1939

IN April 1935 the Air Ministry issued a specification for a two-seat fighter with the endurance to fly standing patrols, a performance comparable to that of contemporary single-seat fighters, and an armament of multiple machine-guns in a powered turret. Boulton Paul had done considerable work on aircraft gun turrets, and their proposal, along with that of Hawker, was accepted. Although the prototype Defiant did not fly until August 1937, 87 production aircraft were ordered in April of that year, and in February and May, 1938, a further 363 were ordered.

The prototype Hawker Hotspur was not completed until mid 1938, and no orders were placed. The Defiant turret carried four Brownings with 600 rounds per gun; elevation and traverse were hydraulically powered, and fairings fore and aft were automatically retracted to allow the guns to pass.

The first prototype Defiant, K8310, with a 1030-hp Merlin I engine, showed a top speed of 486 km/h (302 mph), but the second prototype, K8320, did not fly until May 1939. Deliveries of production aircraft were only beginning at the start of World War II: 264 Squadron, the first to use the type, did not receive them until December 1939.

The Defiant had been intended to fly standing patrols, using its guns to attack bombers from below, but the shortage of fighters in May 1940 led to it being used as a normal interceptor. It enjoyed some early success in this role when flown in company with Hawker Hurricanes. Once the German pilots became aware of the turrets, they attacked head-on; heavy losses were suffered and



the aircraft was withdrawn from the Battle of Britain. They were then switched to night-fighting, and by May 1941 seven night-fighter squadrons were equipped with Defiants, but without radar.

Meanwhile, by the summer of 1940 another 480 Mk Is had been ordered, but from May 1941 production switched to the Mk II. The last of the Mk Is ordered were completed as Mk IIs with the 1280-hp Merlin XX engine. Small airborne interception (AI) radar sets had been developed by 1941, and towards the end of the year AI Mk IV and Mk VI sets began to be installed in Defiants.

From mid 1942 Defiants were relegated to other duties, including target towing, gunnery training and air-sea rescue searches. The last 40 Mk IIs were completed as TT.I target tugs.

Defiant I

Type: two-seat fighter
Maker: Boulton Paul Aircraft
Span: 11.99 m (39 ft 4 in)
Length: 10.77 m (35 ft 4 in)
Height: 3.45 m (11 ft 4 in)
Wing area: 23.23 m^2 (250 sq ft)
Weight: maximum 3900 kg (8600 lb); empty 2757 kg (6078 lb)
Powerplant: one 1030-hp Rolls-Royce Merlin III V-12 liquid-cooled engine
Performance: maximum speed 489 km/h (304 mph) at 5182 m (17 000 ft); range 748 km (465 miles); service ceiling 9251 m (30 350 ft)
Armament: four 0.303-in (7.7-mm) Browning machine-guns
Crew: 2
Production: 723

Potez 63

FIRST FLIGHT 1936

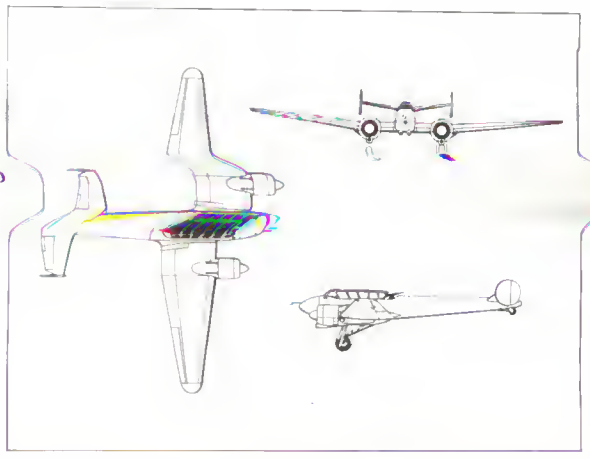
THE Armée de l'Air's 1934 specification for a twin-engined three-seat fighter envisaged an aircraft capable of operating as a two-seat day and night interceptor or escort fighter and as a command fighter with the third man aboard. By April 1936, Potez had flown their model 63.01 (subsequently re-designated 630.1) prototype designed to meet this requirement.

Subsequent derivatives of the basic design included ground-attack and reconnaissance aircraft, but the fighter developments were based on the first and second prototypes. The latter was completed in March 1937 and designated 631.01, being powered by two 580-hp Gnome-Rhône 14Mars engines in place of the earlier model's similarly-rated Hispano-Suiza 14Hbs.

In 1937 Potez was absorbed by the Nord (northern) division of the nationalized French aircraft industry, and received production orders for 80 P.630s and 140 P.631s. The armament originally specified was two 20-mm (0.79-in) Hispano-Suiza cannon in the nose, and a 7.5-mm (0.295-in) machine-gun on a flexible mount in the rear of the crew compartment. However, shortages of the cannon led to early examples having a nose battery of four machine-guns – either way, this was rather light armament for such a big aircraft.

Deliveries of the 631 began in 1938, and by the end of the year two night-fighter squadrons had been equipped with the type. Unfortunately, the Hispano-Suiza engines that powered the 630 proved unreliable, and this model was relegated to training duties, being replaced in operational units by the 631, orders for which had been increased to a total of 210. In pursuit of the command fighter idea, small numbers of 631s were allocated to each of 20 single-seat fighter squadrons, while others formed autonomous squadrons. Early in 1940 it was decided to augment the 631's armament by the addition of three guns under each wing.

When Germany invaded in May 1940, eight squadrons were equipped with the Potez 631, all but one in northern France. During the resistance to the German invasion some of these engaged in ground-attack missions, suffering heavy losses, while others were mistaken for Bf 110s and shot down by Allied fighters. The bulk of the survivors remained in the occupied zone after the armistice, though some were evacuated to Tunisia.



Potez 631

Type: multirole fighter
Maker: Société Nationale de Constructions Aéronautiques du Nord
Length: 11.07 m (36 ft 3¾ in)
Height: 3.6 m (11 ft 9¾ in)
Wing area: 32.70 m² (352 sq ft)
Weight: loaded 4500 kg (9921 lb); empty 2960 kg (6526 lb)
Powerplant: two 660-hp Gnome-Rhône 14M 14-cylinder two-row radials
Performance: maximum speed 445 km/h (276.5 mph) at 4000 m (13 123 ft); range 1220 km (758 miles); operational ceiling 9000 m (29 528 ft)
Armament: two 20-mm (0.79-in) Hispano-Suiza cannon; seven 7.5-mm (0.295-in) MAC 1934 machine-guns
Crew: 2 to 3
Production: approx 1360 (all types)

Above: The Potez 63.0 No 02; the first prototype had demonstrated its good flying qualities when it landed safely after the loss of one engine
Far left: One of the two 630s purchased by the Swiss in February 1938. Other buyers included Czechoslovakia and the Finns. Potez 633s went to Romania, China and Greece
Left: A war-weary Potez 63-11, the mass-produced reconnaissance version, showing the glazed nose

Havoc, Douglas

FIRST FLIGHT 1940

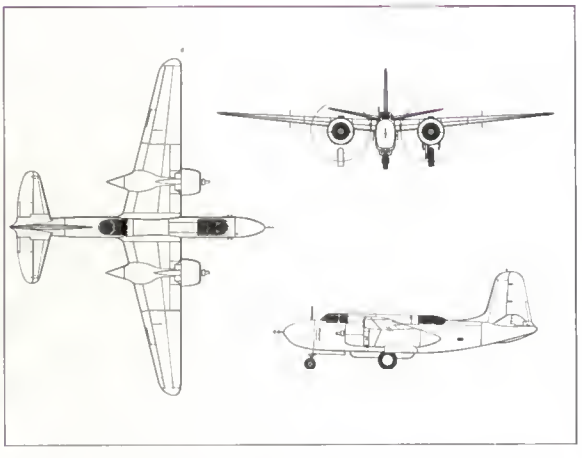
IN the second half of 1940 the first Douglas DB-7 bombers began to arrive in Britain, where they were named Boston. The Boston I (DB-7) was used for training, and the Mks II (DB-7A) and III (DB-7B) were distinguished by 1200-hp Pratt & Whitney R-1830 Twin Wasp and 1600-hp Wright R-2600 Cyclone engines respectively.

The most common conversion involved the replacement of the glazed bombing nose with a solid nose housing eight or twelve 7.7-mm (0.303-in) Browning machine-guns, along with Airborne Interception Mk IV or V radar sets; approximately 100 each of the Havoc Mk I (R-1830, small fin) and Mk II (R-2600, large fin) were produced. In addition, a number of Havoc IVs – later Havoc I (Intruder) – retained the glazed nose and bomb bay and were used as night intruder aircraft.

While only one squadron, No 85, operated the Havoc as a normal night-fighter, using the type from early 1941 until September 1942, considerable effort was devoted to the development of less conventional interception techniques. The first of these involved the use of the Long Aerial Mine, or 'Pandora', which consisted of a small explosive charge suspended on a 610-m (2000-ft) length of piano wire attached to a small parachute. The idea was that curtains of these mines should be dropped in the path of approaching bombers: on snagging a wing, the parachute would drag the mine onto the aircraft, where it would explode.

No 93 Squadron was formed to operate the Havoc I (Pandora) at the end of 1940, and

Top: Bomber turned night-fighter; the first Douglas DB-7s were an ex-French contract that was diverted to Britain in 1940. Radars were then still bulky but the DB-7 could carry one as well as heavy armament
Above left: A Douglas Havoc II with 12-gun nose and A1.IV radar in October 1941
Above: Fresh from the factory, one of the first DB-7s in 1939
Above right: An A-20 Havoc at a USAAF training base



P-70

Type: night-fighter
Maker: Douglas Aircraft Co
Span: 18.7 m (61 ft 4 in)
Length: 14.5 m (47 ft 7 in)
Height: 5.36 m (17 ft 7 in)
Wing area: 43.11 m^2 (464 sq ft)
Weight: loaded 9645 kg (21 263 lb); empty 7272 kg (16 032 lb)
Powerplant: two 1600-hp Wright R-2600-11 14-cylinder two-row radials
Performance: maximum speed 529 km/h (329 mph) at 4267 m (14 000 ft); range 1706 km (1060 miles); operational ceiling 8611 m (28 250 ft)
Armament: four 20-mm (0.79-in) cannon
Crew: 2
Production: 60

although one probable and one definite kill were claimed, the device proved both ineffective and dangerous to use. Accordingly, towards the end of 1941 the squadron was disbanded to form one of ten flights operating the Havoc I (Turbinlite).

The Turbinlite was a 2700-million candlepower searchlight mounted in the nose of an unarmed Havoc. This time the plan was to use the radar to locate a target, then illuminate it with the searchlight, whereupon an accompanying Hurricane could shoot it down. Although 70 Havocs were modified to use the device, the difficulty of co-ordinating Havoc and Hurricane at night, and the ease with which the target could escape the beam, meant that by the time Turbinlite squadrons were disbanded in January 1943 only two enemy aircraft plus a Stirling had been destroyed, while 17 Havocs had been lost in accidents.

The RAF's use of the Havoc inspired the USAAF to order similar conversions while awaiting the Northrop P-61 Black Widow. Accordingly, 63 A-20s were given flame-damping exhausts, matt black finish and British AI-IV radar to become P-70s. These were armed with four 20-mm (0.79-in) cannon in a ventral tray. The cannon were replaced by six 12.7-mm (0.5-in) machine-guns in the P-70A-1. Subsequent models had a similar armament mounted in the nose. These included 65 P-70A-2s and 106 P-70Bs, the latter using SCR-520 radar.

Some of the earlier conversions saw operational service in the Pacific, throughout 1943–44, but most were used for crew training.

Beaufighter, Bristol

FIRST FLIGHT 1940

IN the autumn of 1938 the Bristol company suggested a fighter version of their new Beaufort torpedo bomber. The conversion involved using Hercules instead of Taurus engines, with propellers of increased diameter, and redesigning the entire fuselage. The pilot sat centrally in a very short nose. Four prototypes were ordered in 1939, the first flying in July, 1940.

Production of the Beaufighter I, with 1560-hp Hercules III or XI, reached 915, while another 450 Mk IIs used the 1280-hp Rolls-Royce Merlin XX to guard against the possible shortage of the Hercules. An early modification was the provision of six 7.7-mm (0.303-in) machine-guns in the wings (four on the right, two on the left), and after the first 400 had been completed a belt feed was introduced for the cannon. Other modifications were aimed at curing problems of stability, particularly evident in the Mk II, and after various solutions had been tried, dihedral was added to the tailplane.

By early 1942 the Mk VI was in production, with 1595-hp Hercules VI or XVI engines. A total of 1732 Mk VIs were built, and of these 50 were torpedo-carrying conversions designated Mk VI (ITF) as interim torpedo fighters. Dive-brakes were fitted, and in the 2205 production TF.Xs that followed, low-altitude Hercules XVII engines were used and a torpedo-aimer's position was provided just aft of the pilot's cockpit.

The Beaufighter X was frequently equipped with wing racks for rockets or bombs, as was the

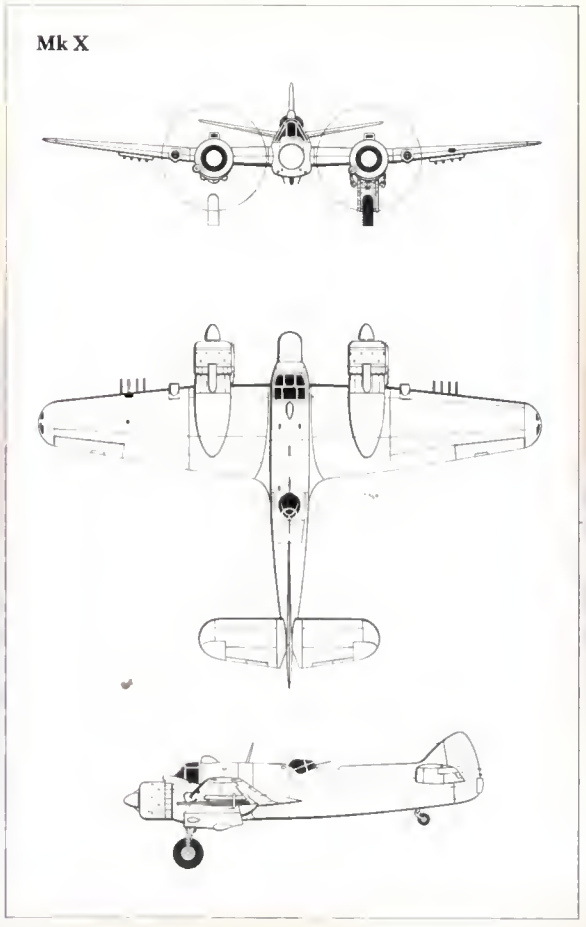
Below left: A Beaufighter TF. X converted to a (TT.10) target tug after the war
Below: A Beaufighter Mk II in overall black with wing and nose mounted AI. Mk IV radar for night interception. The 'Beau' was a very effective night-fighter with a big enough fuselage to take radar and sufficient range to stay airborne for long periods
Bottom: A well-used Bristol Beaufighter VIF takes off in North Africa. It appears to have a non-standard nose, with a large ram inlet in the centre instead of a camera or radar aerial

final British production version, the Mk XI, which dispensed with the torpedo capability: 163 Mk XIs were built. When production by the Government Aircraft Factory began in Australia in 1943 the designation Beaufighter 21 was used. Powerplant was two Hercules XVIII engines, and wing armament was changed to four 12.7-mm (0.5-in) machine-guns; otherwise the 364 built were based on the Mk X, but without the torpedo capacity.

The Beaufighter's initial service was as a night-fighter. The first squadron deliveries were made in September 1940. AI Mk IV airborne interception radar was installed as sets became available. From early 1942 the centimetric AI Mk VII and VIII were installed, with the aerial in thimble fairings on Mk VIF night-fighters. By early 1943 four United States Army Air Force night-fighter squadrons were operating Beaufighters alongside RAF units in the Mediterranean.

Meanwhile, the Mk IC had entered service with Coastal Command in early 1941, the night-fighter designation being amended to Beaufighter IF. The Mk IC dispensed with the wing armament in favour of additional fuel tanks, roughly two-fifths of the Mk Is being adapted in this way. All the Mk IIs were delivered as night-fighters, but 693 Mk VICs had the extra wing fuel tanks, and many of these were also given the Vickers K gun in the rear cockpit that became standard on the TF.X.

The range of armament options made the Beaufighter a potent ground-attack and anti-shipping aircraft, while its gun armament was one of the heaviest carried by any wartime fighter.



Beaufighter IF

Type: multirole fighter
Maker: Bristol Aeroplane Co
Span: 17.63 m (57 ft 10 in)
Length: without radar 12.6 m (41 ft 4 in)
Height: 4.83 m (15 ft 10 in)
Wing area: 46.73 m^2 (503 sq ft)
Weight: maximum 9470 kg (21 100 lb); empty 6382 kg (14 070 lb)
Powerplant: two 1560-hp Bristol Hercules III or XI 14-cylinder sleeve-valve radials
Performance: maximum speed 520 km/h (323 mph) at 4572 m (15 000 ft); range 1883 km (1170 miles); operational ceiling 8077 m (26 500 ft)
Armament: four 20-mm (0.79-in) Hispano cannon; six 0.303-in (7.7-mm) Browning machine-guns
Crew: 2
Production: 525 (5564 all types)

CR.42 Falco, Fiat

FIRST FLIGHT 1939

THE last of Celestino Rosatelli's classic biplane fighters retained the characteristic lines of his CR.32, from which it was developed during the late 1930s via the experimental CR.33, 40 and 41. By early 1939, when test flights of the prototype Falco began, biplane fighters were already something of an anachronism. However, manoeuvrability, undoubtedly one of the CR.42's strong points, was a prime consideration in the Regia Aeronautica, as was an open cockpit. Production was authorized, despite the fact that a top speed of 440 km/h (273 mph) and an armament of only two machine-guns – one 7.7-mm (0.303-in) and one 12.7-mm (0.5-in) – must have appeared unlikely to prove adequate in combat.

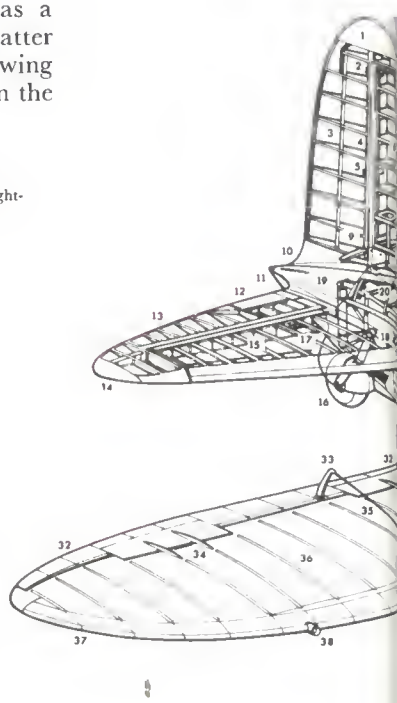
Substantial numbers were exported: 50 went to Hungary, 34 to Belgium, and 72 to Sweden, where they were designated J 11 and served until 1945.

On June 10, 1940, Italy joined Germany in declaring war on the Allies. By this time over 300 Falcos were operational. Following the armistice between France and Germany the Corpo Aereo Italiano was formed to assist the Luftwaffe in its attempted destruction of British air power. Including 50 Falcos on its strength, the corps moved to Belgium in October 1940, but only two missions were mounted and little was achieved.

The Falco saw more extensive service as a bomber escort in the Mediterranean and as a ground-attack aircraft in North Africa, in the latter role being fitted with tropical equipment and wing racks for two 100-kg (220-lb) bombs and given the

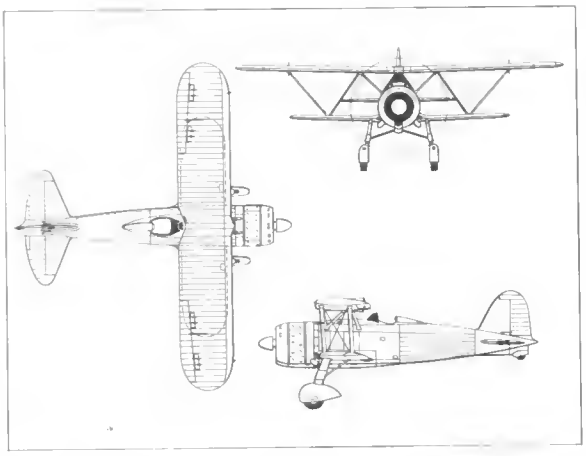
Above: The Fiat CR.42 in standard desert camouflage with unit markings. The last remaining example of the Falco is in England – it was shot down during the Battle of Britain, repaired and test flown

Above right: The ICR.42, an experimental floatplane version



CR.42

1 Rudder balance
2 Rudder upper hinge
3 Rudder frame
4 Rudder post
5 rudder hinge
6 Tailfin structure
7 Tailfin front spar
8 Tailfin frame support
9 Rudder actuating hinge
10 Tailcone
11 Tail navigation light
12 Elevator tab
13 Right elevator
14 Elevator balance
15 Tailplane structure
16 Fixed tailwheel
17 Hinged tailwheel spat
18 Tailwheel leg assembly
19 Tailwheel shock absorber
20 Fuselage end post frame
21 Fuselage/tailfin frames
22 Tailfin leading edge
23 Left elevator
24 Elevator balance
25 Left tailplane
26 Rudder cable turnbuckles
27 Fuselage dorsal decking formers
28 Elevator tab control cables
29 Fuselage upper frame
30 Fuselage fabric stringers
31 Lifting point
32 Right aileron
33 Aileron hinge
34 Aileron leading-edge balances
35 Aileron control cable
36 Wing fabric covering
37 Right upper wingtip
38 Right navigation light
39 Aileron control cable turnbuckle
40 Aileron control cable run
41 Wing ribs
42 Wing rear spar
43 Fuselage framework
44 Elevator control rod linkage
45 Rudder cables
46 Fuselage cross-frame members
47 Pilot's headrest fairing
48 Pilot's headrest
49 Cockpit coaming
50 Oxygen cylinder
51 Fire extinguisher
52 Pilot's seat
53 Compressed air cylinder
54 Air cleansing filter
55 Compressor
56 Pilot's seat support frame
57 Rudder bar assembly
58 Control column
59 Instrument panel
60 Gunsight
61 Windscreen
62 Windshield frame
63 Pilot's entry handhold
64 Wing structure
65 Generator for underwing searchlights (night-fighter variant)
66 Fuselage/upper wing rear strut (aileron cable run)
67 Interplane strut attachment
68 Upper wing rear spar
69 Internal cross-brace wires
70 Wing ribs
71 Left aileron
72 Aileron leading-edge balances
73 Aileron hinge
74 Interplane outer strut attachment
75 Wing outer ribs
76 Left upper wingtip
77 Left navigation light
78 Wing leading-edge
79 Upper wing front spar
80 Aileron control cable turnbuckle
81 Interplane cross-brace wires
82 Pitot head
83 Interplane outer struts
84 Left lower wing
85 Strut lower attachment
86 Lower wing rear spar
87 Wing skinning
88 Gun muzzles
89 Fuselage/upper wing strut assembly
90 Strut/upper wing centre join
91 Internal brace
92 Upper wing centre-section profile
93 12.7-mm (0.5-in) machine-gun
94 Ammunition feed chute
95 Ammunition magazine
96 Fuselage supplementary fuel tank
97 Cartridge collector box
98 Fuselage main fuel tank
99 Fuselage frame
100 Strut attachment point
101 Machine-gun blast tube
102 Access panels
103 Fuel filler point
104 Oil filler point
105 Gun muzzle troughs
106 Gun synchronization control
107 Supplementary oil tank
108 Engine bearer attachment
109 Compressor
110 Main oil tank
111 Firewall/bulkhead
112 Cooling gills
113 Filter
114 Engine cowling ring
115 Exhaust collector ring
116 Cowling panelling
117 Fiat A.74R radial engine
118 Cylinder head fairings
119 Cowling nose profile
120 Propeller control mechanism
121 Propeller hub
122 Fiat three-blade propller
123 Spinner
124 Wheelspat strakes (servicing access)
125 Carburettor intake
126 Left wheelspat
127 Left mainwheel
128 Carburettor intake trunking
129 Exhaust outlet
130 Radiator wingroot intake
131 Intake duct
132 Right oil radiator assembly
133 Wingroot exhaust
134 Lower wing end rib/fuselage attachment
135 Landing gear attachment
136 Landing gear rear strut attachment
137 Lower wing structure
138 Interplane inner struts
139 Pitot bead
140 Interplane outer struts
141 Lower wing trailing edge
142 Rear spar
143 Interplane strut attachment
144 Wing ribs
145 Front spar
146 Landing gear leg rear strut
147 Landing gear leg
148 Brace strut
149 Leg/trouser attachment
150 Landing gear trouser join
151 Torque strut
152 Axle
153 Brake line
154 Wheelspat stakes (servicing access)
155 Hub access panel
156 Mainwheel spat
157 Right mainwheel
158 Underwing searchlights (night-fighter variant)



CR.42 Falco

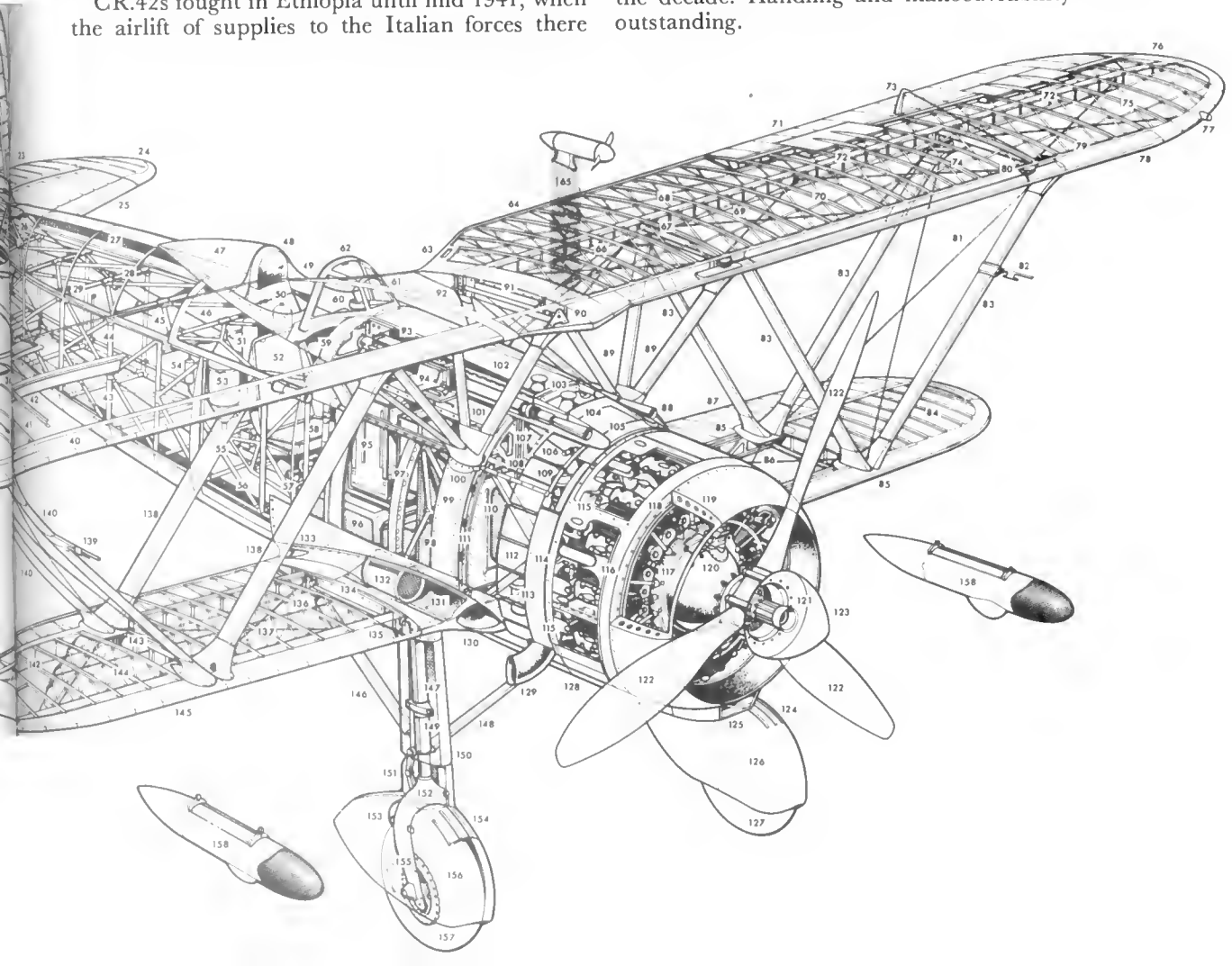
Type: biplane fighter
Maker: Aeronautica D'Italia SA (Fiat)
Span: 9.7 m (31 ft 10 in)
Length: 8.25 m (27 ft 0¾ in)
Height: 3.06 m (10 ft 0½ in)
Wing area: 22.4 m^2 (241.12 sq ft)
Weight: loaded 2283 kg (5033 lb); empty 1782 kg (3929 lb)
Powerplant: one 840-hp Fiat A74.RC38 14-cylinder two-row air-cooled radial
Performance: maximum speed 430 km/h (267 mph) at 5330 m (17 487 ft); range 775 km (482 miles); operational ceiling 10 200 m (33 465 ft)
Armament: one 12.7-mm (0.5-in) and one 7.7-mm (0.303-in), or two 12.7-mm Breda-SAFAT machine-guns
Crew: 1
Production: 1781 (all types)

designation CR.42AS (*Africa Settentrionale*, or North Africa). Armament of later production CR.42s was increased to two 12.7-mm (0.5-in) machine-guns. The only other production version of the Falco, the CR.42*bis*, had a further pair of 12.7-mm guns under the wings to augment the original pair on top of the forward fuselage.

Experimental versions included the twin-float ICR.42 (*Idrovolante*, or seaplane), a single example of which was built by CMASA in 1940, and the CR.42B of 1941, another one-off prototype powered by a 1010-hp Daimler-Benz DB 601 liquid-cooled engine: maximum speed with this powerplant was 520 km/h (323 mph).

CR.42s fought in Ethiopia until mid 1941, when the airlift of supplies to the Italian forces there petered out. They were heavily involved in the battles for Greece and Crete during 1940, and subsequently saw considerable action in the desert fighting in North Africa. By 1943 the Falco had been switched to other tasks, including anti-shipping strikes. Towards the end of 1941 the CR.42CN (*Caccia Notturna*, or night-fighter) conversion had appeared, equipped with radio and a pair of searchlights below the wings, but the night-fighter Falcos proved of little use.

Of the 1781 Falcos produced, only 113 were left in Italian service when Italy surrendered in September 1943: a few were used by the co-belligerent air force and survived as trainers until the end of the decade. Handling and manoeuvrability were outstanding.



P-43 Lancer, Republic

FIRST FLIGHT 1940

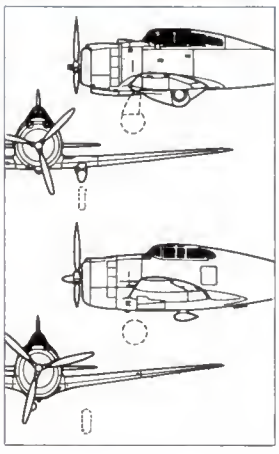
THE last of the 76 P-35s built for the United States Army Air Corps were completed to a revised design as the AP-4. Delivered to the army in 1938 as the XP-41, this aircraft was powered by a turbo-supercharged 1200-hp Pratt & Whitney R-1830-45 Twin Wasp engine in a reworked cowling. It also featured a new landing gear whose main units retracted inwards into the wings, rather than backwards into large 'trouser' fairings. The span showed a slight increase, but overall length remained the same as that of the P-35, and performance was sufficient for 13 service-test machines to be ordered with the designation YP-43.

The company was re-organized to become Republic Aviation in October 1939, and the first examples were delivered in September 1940. Further redesign resulted in a simplified landing gear and cleaner fuselage lines, and an increase in armament to two 0.5-in (12.7-mm) machine-guns in the nose and one 0.3-in (7.62-mm) gun in each wing. Although gross weight of the YP-43 was almost 40% greater than that of the P-35, with a consequent adverse effect on rate of climb, the new fighter retained the great range of its predecessor. The turbo-supercharger improved altitude performance to give it a top speed of 562 km/h (349 mph) at 7620 m (25 000 ft) compared with the P-35's 452 km/h (281 mph). Fifty-four production P-43 Lancers were ordered by the USAAC at the end of 1940.

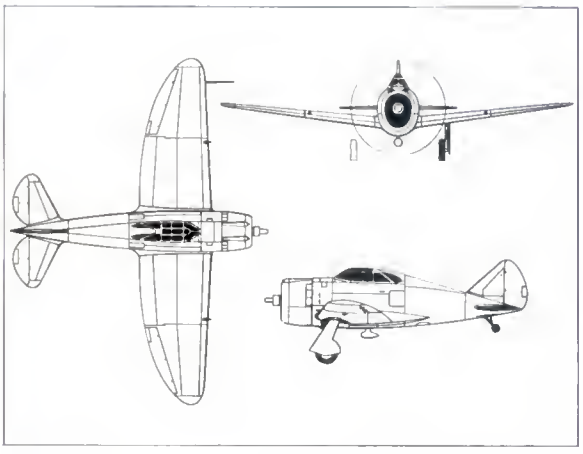
The AP-4J was based on the new 1400-hp Pratt & Whitney R-2180 Twin Hornet, and in October 1939 the USAAC ordered 80 examples of this new fighter to be designated P-44. However, in mid 1940 the P-44 order was dropped in favour of the P-47 Thunderbolt. To keep the line open 80 P-43As which used the R-1830-39 engine but were otherwise similar to the P-43, were substituted for the 1939 order for 80 P-44s.

The final P-43 production version was the P-43A-1, whose R-1830-57 engine gave it a top speed of 579 km/h (360 mph). The 0.5-in guns were moved to the wings. An order for 125 was made in 1941 for supply to the RAF under Lend-Lease. These were eventually rejected by the British, and the majority (108) went instead to the Chinese Nationalist air force. The rest of the P-43s and P-43As (150 in all) were then equipped with cameras for use as USAAF P-43B reconnaissance aircraft. Two had different camera installations and were designated P-43C; P-43D and P-43E were also allocated for photo-reconnaissance conversions of the P-43 and P-43A-1. The 17 remaining P-43A-1s were supplied to the Royal Australian Air Force after conversion.

Republic's modest start in fighter production was to lead to greater things, and perhaps the main significance of the P-43 was its place in the evolution of the later P-47 Thunderbolt, one of the most successful fighter-bombers of World War II. Lancers were never used as fighters by the USAAF, and the relatively small orders placed at a time of general rearmament may be seen as encouragement for Republic's progression towards the Thunderbolt; ultimate development of the line begun with the P-35. They were also a means of keeping the production line functioning.



Top: The P-43 in wartime camouflage. The Lancer saw little service with the Western Allies, but did operate successfully with the Chinese
Above: A P-43A; this aircraft had an R-1830-49 engine but was otherwise very similar to the P-43
Right: The change in landing gear in the YP-43 from a rearward retracting design to an inward retracting system on the P-43
Far right: Family resemblance to the first P-47 Thunderbolt can be seen in this P-43



P-43 Lancer

Type: fighter and photo-reconnaissance aircraft
Maker: Republic Aviation Corporation
Span: 10.97 m (36 ft)
Length: 8.69 m (28 ft 6 in)
Height: 4.27 m (14 ft)
Wing area: 20.72 m^2 (223 sq ft)
Weight: loaded 3543 kg (7810 lb); empty 2565 kg (5654 lb)
Powerplant: one 1200-hp Pratt & Whitney R-1830-49 14-cylinder air-cooled radial
Performance: maximum speed 562 km/h (349 mph) at 7620 m (25 000 ft); range 1287 km (800 miles); operational ceiling 11 582 m (38 000 ft)
Armament: two 0.5-in (12.7-mm) and two 0.30-in (7.62-mm) Browning machine-guns
Crew: 1
Production: 272 (all types)

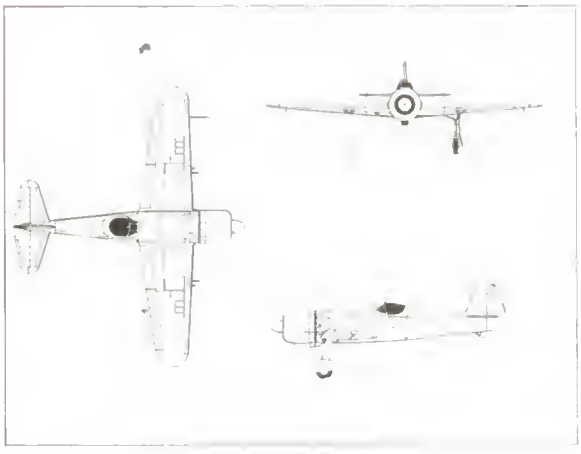
IAR 80

FIRST FLIGHT 1939

Left and below: The Romanian IAR.80 was the only indigenous design to be built by the national aircraft industry. It was used both as a fighter and fighter-bomber on the Eastern Front, and is seen here with the yellow fuselage band of Axis aircraft operating in that theatre

THE Industria Aeronautica Romana, at Brasov, had produced a few of its own designs during the 1930s, but was concerned mainly with the construction under licence of Polish types, including the PZL P.11 and P.24 fighters. In 1937, when the rights to build the P.24E were acquired IAR began the design of a new fighter, which was intended to use as many P.24E components as possible. In fact, the prototype, which made its first flight in 1939, used the rear fuselage, tail and engine installation of the Polish fighter allied to a new forward fuselage, and low-mounted wings instead of the characteristic PZL gull type. Another new feature was a retractable landing gear, and the wings also housed four 7.92-mm (0.312-in) machine-guns. Before production, began, it was decided to substitute the 1025-hp IAR K14-1000A (Gnome-Rhône) engine, and new wings of increased span and a lengthened fuselage.

The IAR 80 finally succeeded the P.24E in production in 1941, and a total of 50 of the original model were followed by 90 IAR 80As, which had an extra pair of wing-mounted machine-guns, and 31 IAR 80Bs with improved radio and a pair of 13.2-mm (0.52-in) machine-guns along with four of the lighter weapons. The IAR 81 was a dive-bomber development of the 80A, whose slightly lengthened wings could carry two 50-kg (110-lb) bombs each in addition to a 250-kg (551-lb) bomb below the fuselage. Fifty were built, and were followed by 29 IAR 81As, with six 7.92-mm machine-guns. The 81B carried fuel tanks in place of the bombs under the wings. It was armed with



the standard four 7.92-mm guns plus two Oerlikon (Ikaria) MG FF or Mauser MG 151 20-mm (0.79-in) cannon, a similar armament being fitted to the 38 IAR 81Cs, with bomb racks.

The 81C was the last version produced, as the IAR factory turned to assembly of the Messerschmitt Bf 109G in early 1943 and continued in this work until it was destroyed by bombing in the spring of 1944. The various 80/81 models were used by home defence squadrons of the Romanian air force until 1947, and as ground-attack fighters on the Eastern Front in 1942–43. Some of the survivors were converted to two-seat IAR 80DC dual-control trainers after World War II, while the remaining operational fighters were replaced by Soviet La-7s and Yak-9s from 1948.

IAR 80A

Type: single-seat fighter
Maker: Industria Aeronautica Romana
Span: 10.5 m (34 ft 5½ in)
Length: 8.9 m (29 ft 2½ in)
Height: 3.6 m (11 ft 9¾ in)
Wing area: 15.97 m² (171.9 sq ft)
Weight: maximum 2490 kg (5489 lb); empty 1783 kg (3931 lb)
Powerplant: one 1025-hp IAR (Gnome-Rhône) K14 14-cylinder air-cooled radial
Performance: maximum speed 510 km/h (317 mph) at 4000 m (13 123 ft); range 940 km (584 miles); operational ceiling 10 500 m (34 450 ft)
Armament: six 0.312-in (7.92-mm) FN-Browning machine-guns
Crew: 1
Production: 90

F4F Wildcat, Grumman

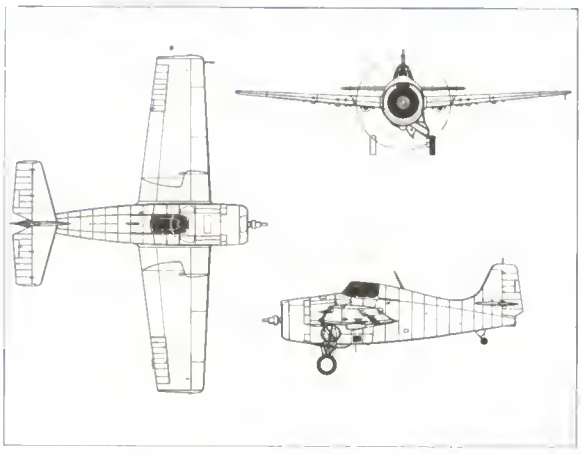
FIRST FLIGHT 1937

Left: A Grumman F4F-4 Wildcat touches down on a US carrier. Though inferior in some respects to the Japanese Zero, the F4F was much tougher and had a kill ratio of 6.9:1. However, many of these victories were against bombers and transports
Below: Thumbs up from Lieutenant O'Hare before take-off. He was credited with five kills against Japanese aircraft

IN 1935 the US Navy ordered prototypes of two new fighters, the monoplane Brewster XF2A-1 and the biplane XF4F-1 from Grumman. Subsequent trials with a number of new monoplanes convinced the navy that the biplane had had its day. In any case Grumman's previous F3F-2 offered performance almost equal to that expected from the new design. In July 1936 the Grumman contract was cancelled in favour of a new order for a monoplane designated G-18 by the company and XF4F-2 by the navy. The first prototype flew for the first time in September 1937, powered by a 1050-hp Pratt & Whitney R-1830-66 Twin Wasp but after a long series of trials had revealed a top speed of 467 km/h (290 mph), problems with the engine caused the Grumman design to be rejected in favour of the Brewster F2A. However, a modified version, the G-36, was ordered as the XF4F-3, which flew in February 1939. Square-tipped wings of increased span and a two-stage supercharger for the R-1830-76 engine resulted in a top speed of 537 km/h (333.7 mph), and in August 1939, 54 production F4F-3s were ordered.

The first of these flew for the first time in February 1940, and the second in the following July. By the time production of the -3 ended in 1941, 185 had been built, though 21 unarmed F4F-7 reconnaissance versions were built in 1942, and 100 F4F-3 trainers in 1943, during which year one F4F-3 was tested as a twin-float seaplane.

Meanwhile, orders were placed in 1939 by France and Britain for 81 G-36As and 100 G-36Bs respectively. The French version used a 1200-hp



Wright R-1820 Cyclone engine and was to be armed with six 7.5-mm (0.295-in) Darne machine-guns. However the first example was not completed until May 1940, and so the remaining G-36As were supplied to Britain and named Martlet I. Two of the US Navy's F4F-3s were also tested with the Cyclone as XF4F-5s, and one was designated XF4F-6 as an engine-trials aircraft. Another 95 F4F-3As were ordered with R-1830-90 engines using single-stage superchargers. Thirty of these were despatched to Greece in March 1941, but taken over by the Fleet Air Arm after the defeat of Greece and used as Martlet IIIs in North Africa.

Martlet II was the designation of a new version developed for the Fleet Air Arm and substituted for the G-36B originally ordered. Featuring folding

F4F-4

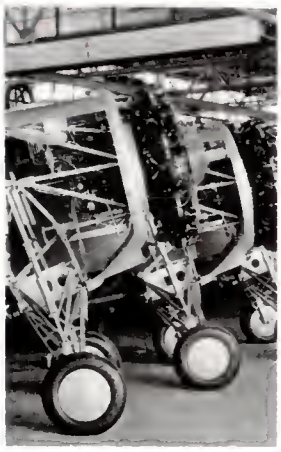
Type: shiphoard fighter
Maker: Grumman Aircraft Engineering Corporation
Span: 11.58 m (38 ft)
Length: 8.84 m (29 ft)
Height: 3.45 m (11 ft 4 in)
Wing area: 24.16 m^2 (260 sq ft)
Weight: maximum 3607 kg (7952 lb); empty 2624 kg (5785 lh)
Powerplant: one 1200-hp Pratt & Whitney R-1830-86 Twin Wasp 14-cylinder two-row radial
Performance: maximum speed 515 km/h (320 mph) at 5730 m (18 800 ft); range 1336 km (830 miles); operational ceiling 10 364 m (34 003 ft)
Armament: six 0.5-in (12.7-mm) Browning machine-guns
Crew: 1
Production: 7344 (all types)

wings, except on the first ten, six 12.7-mm (0.5-in) machine-guns and a Cyclone powerplant, 100 Martlet IIs were delivered by April 1941. Folding wings and a similar armament were also used on the US Navy's next production version, the F4F-4, using the R-1830-86 fitted to later F4F-3s. Grumman built 1169 F4F-4s, plus 220 Cyclone-powered Martlet IVs for the Royal Navy.

From 1942 the Eastern Aircraft Division of General Motors built another 839 with four guns and the designation FM-1, in addition to 312 Cyclone-powered Martlet Vs. Grumman concentrated on the F6F Hellcat from 1943, leaving Wildcat construction to Eastern, and in that year production switched to the FM-2 (XF4F-8), with 1350-hp R-1820-56 Cyclone engine and many other changes included a taller fin and four-gun armament: 4407 FM-2s were built for the US Navy, and 370 Martlet VIs for the Fleet Air Arm.

In December 1941, 245 Wildcats were in US service. For the next two years the F4F was the main US Navy and Marine Corps fighter, and when the type began to be replaced aboard aircraft carriers by Hellcats in 1943 it saw extensive service aboard the new escort carriers, for which the lightened FM-2 was developed. The British Martlets, the Fleet Air Arm's first monoplane fighters, were renamed Wildcats in 1944.

Although not in the front rank in terms of performance, the Wildcat was strong and well armed. In the hands of an experienced pilot it proved the equal of the Japanese A6M Zero. However, over 1800 Wildcats were lost in 1940–45.



Above: An FM-2 in pre-1942 markings operated by the Confederate Air Force at an air display in 1976
Right: The engine mounting, in this case for the Wright R-1820 Cyclone
Centre right: An FM-2 prepares to take-off; this final version was known as the Wildcat VI by the British who received 340, the USN total being 4127. The FM-2s were standard equipment for escort carriers until the end of the war

Top: An F4F in the striking markings of the USN in early 1942. The landing gear retracting into the fuselage was typical of the Grumman designs of the 1930s
Above: Royal Navy Martlets (as the F4F was at first known in British service) on the deck of an escort carrier
Left: In British markings a batch of aircraft await delivery. The type first saw action against the Germans off the coast of Britain in late 1940

G.50 Freccia, Fiat

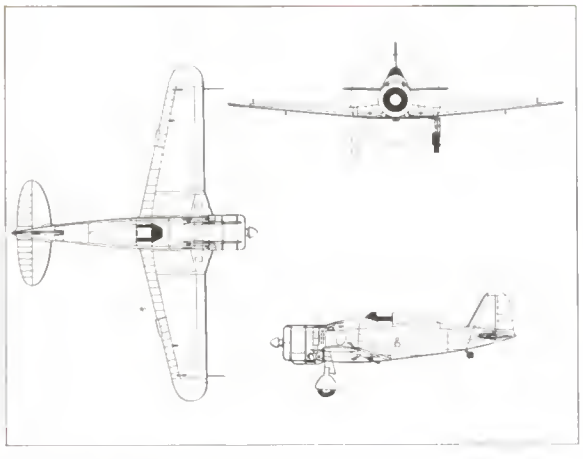
FIRST FLIGHT 1937

Far left: Fiat G.50*bis* of 13ª Squadriglia on patrol in a loose formation
Left: Groundcrew of 352ª Squadriglia reload the 12.7-mm (0.5-in) Breda-SAFAT machine-guns of a G.50 during the abortive Italian operations from Belgium against England in October 1940
Below: The G.50 had an open cockpit with clear side panels which folded down. Italian pilots preferred this, because it gave better visibility

THE contemporary of the Macchi C.200 and Reggiane Re 2000, Giuseppe Gabrielli's G.50 became the first of the trio to fly in February 1937. It was also the Regia Aeronautica's first all-metal monoplane fighter, though with an 840-hp Fiat A74 engine it was somewhat underpowered. Also, its armament of two 12.7-mm (0.5-in) machine-guns, with only 150 rounds each, could hardly be considered adequate.

Nevertheless, 45 Freccias were ordered from CMASA. In January 1938, the first 12 were despatched to Spain for operational evaluation with the Italian forces fighting on the Nationalist side in the civil war, following which another 200 were ordered with open-topped cockpits. In 1939 another 35 were ordered by Finland, and after being delayed in Germany en route they were delivered in 1940.

The first flight of an unarmed two-seat trainer, the G.50B took place in April 1940, and the following September it was joined by the prototype G.50*bis*, which incorporated a number of detail improvements. Next came the G.50*ter*, first flown in July 1941 with a 1000-hp Fiat A76 engine, but development of this version was halted by the cancellation of the A76 programme. More radical redesigns resulted in the G.50V, powered by the liquid-cooled Daimler-Benz DB 601A, and the single G.50*bis*-A two-seat fighter-bomber, first flown in October 1942 and intended for carrier service. The prototype G.50V flew in August 1941, but a planned production version designated G.52 was abandoned in favour of the G.55, and the G.50*bis*-A became redundant when the planned aircraft carriers failed to materialize.



The final total of 774 Freccias built for the Regia Aeronautica included 108 trainers and 421 of the G.50*bis*, nine of which went to the Croatian air force. By June 1940, when Italy joined World War II, 118 G.50s were in service, equipping one fighter Stormo; a number of these went to Belgium with the Corpo Aereo Italiano later that year. Others took part in the Greek, Balkan and North African campaigns as fighters and ground-attack aircraft, before being replaced in the last-named theatre by the G.50*bis* from late 1940. Freccias were also used as bomber and convoy escorts in the Mediterranean, while the aircraft supplied to Finland gave good service against the Soviet Union.

G.50*bis*

Type: monoplane fighter
Maker: Costruzioni Meccaniche Aeronautiche SA (Fiat)
Span: 11 m (36 ft 1 in)
Length: 8.29 m (27 ft 2½ in)
Height: 3.6 m (11 ft 9¾ in)
Wing area: 18.25 m² (196.45 sq ft)
Weight: loaded 2500 kg (5511 lb); empty 2015 kg (4442 lb)
Powerplant: one 840-hp Fiat A74.RC38 14-cylinder two-row radial
Performance: maximum speed 486 km/h (302 mph) at 6000 m (19 685 ft); range 1000 km (621 miles); operational ceiling 10 750 m (35 269 ft)
Armament: two 12.7-mm (0.5-in) Breda-SAFAT machine-guns
Crew: 1
Production: 421 (774 all types)

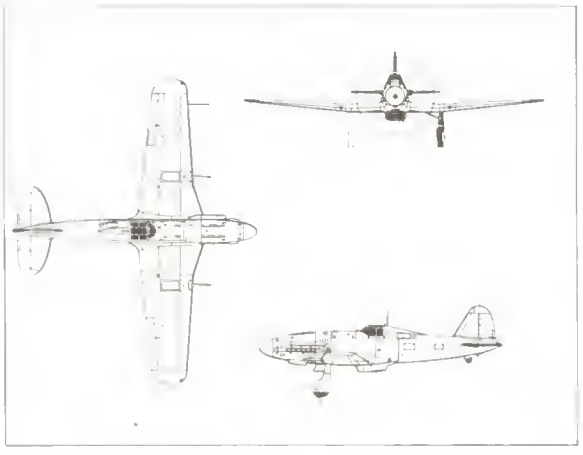
G.55 Centauro, Fiat

FIRST FLIGHT 1942

THE main deficiencies of the Fiat G.50, shortage of power and poor armament, were successfully remedied by the G.55 development, the prototype of which flew for the first time in April 1942. The Freccia's underpowered radial gave way to the 1475-hp Daimler-Benz DB 605A-1 liquid-cooled engine, and its two 12.7-mm (0.5-in) machine-guns were augmented in the prototype and pre-production G.55/0 by a 20-mm (0.79-in) Mauser MG 151/20 cannon firing through the propeller hub. At the same time, the airframe itself was considerably refined, and on the first production model, the G.55/I, a further two MG 151/20s were added in the wings.

Unfortunately for the Regia Aeronautica, squadron deliveries were only just beginning when the armistice between Italy and the Allies was signed in September 1943. Most of Italy was still under German occupation at the time, however, and it was decided that the G.55 would be used to equip the Aviazione della Repubblica Sociale Italiana the air arm of the puppet regime established under the nominal leadership of Mussolini. Large orders were placed with Fiat, most of whose factories were also in the German-occupied area. These orders could hardly be considered realistic as shortages of both the DB 605A-1 and the Fiat licence-built version, the RA.1050 RC.58 Tifone, reduced production to a trickle. By the time German resistance in Italy ended in April 1945, only 105 Centauros had been completed, and these had been issued to various fighter units of the RSI air force.

Meanwhile, 1944 had seen two more G.55 developments take to the air. The G.55/II dispensed with the nose machine-guns, adding a second pair of MG 151/20s in the wings; and the G.55S (*Silurante*, or torpedo-carrier) replaced the ventral radiator with underwing radiators to accommodate a torpedo below the fuselage. Also flown in 1944 was the prototype of the G.56, which was powered by the 1750-hp DB 603A and achieved a top speed of 685 km/h (426 mph), but there was no prospect of sufficient DB 603s being available for production to be undertaken. Production of the G.55 was resumed after the war, with a total of 85 being built in two versions, the G.55A fighter and G.55B two-seat trainer. It was one of the best of all piston-engined fighters and a complete contrast to the G.50.



G.55/I Centauro

Type: monoplane fighter/fighter-bomber
Maker: Aeronautica D'Italia SA (Fiat)
Span: 11.84 m (38 ft 10½ in)
Length: 9.37 m (30 ft 9 in)
Height: 3.13 m (10 ft 3¼ in)
Wing area: 21.11 m² (227.27 sq ft)
Weight: maximum 3710 kg (8179 lb); empty 2630 kg (5798 lb)
Powerplant: one 1475-hp Daimler-Benz DB 605A-1 or Fiat RA.1050 RC58 Tifone V-12 liquid-cooled engine
Performance: maximum speed 620 km/h (385 mph) at 7000 m (22 966 ft); range 1200 km (746 miles); operational ceiling 13 000 m (42 651 ft)
Armament: three 20-mm (0.79-in) Mauser MG 151/20 cannon; two 12.7-mm (0.5-in) Breda-SAFAT machine-guns
Crew: 1
Production: approx 200 (all types)

Above: A G.55 in the colours of the German-controlled Aviazione della RSI (Repubblica Sociale Italiana)
Far left: A production G.55/0 powered by a DB 605A-1 engine. This German powerplant was made under licence by Fiat
Left: The radiator intake beneath the fuselage of the G.55 was replaced by twin intakes under the wings on the torpedo-carrying versions

C.200, Macchi

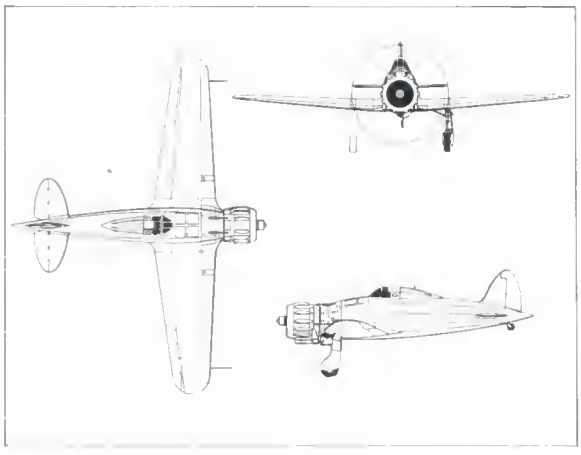
FIRST FLIGHT 1937

TOGETHER with the Fiat G.50 and Reggiane Re 2000, the Macchi C.200 was produced for the Regia Aeronautica's expansion programme of the late 1930s. Like its contemporaries, it was handicapped by the necessity of using a relatively low-powered engine, in this case the 840-hp Fiat A74. While performance was better than its rivals, and manoeuvrability was excellent, armament was restricted to only two machine-guns.

Designed by Mario Castoldi, the first prototype C.200 was flown in December 1937, and the following year production began with an order for 99 machines. These used a more powerful version of the A74, and later production batches had an open-topped cockpit instead of the original clumsy-looking enclosed canopy. The wings had to be modified at an early stage after they were found to be responsible for a dangerous susceptibility to high-speed stalls, and the last C.200s to be built were fitted with the wings of the C.202, thus gaining a pair of 7.7-mm (0.303-in) machine-guns.

Altogether, 1143 C.200s were built, 395 by Macchi and the rest by SAI-Ambrosini and Breda. The C.201 development was planned to have the more powerful A76.RC40 engine. But the A76 was abandoned and the C.201 was in any case rendered unnecessary by the appearance of the C.202 Folgore, the prototype of which flew in August 1940, the same month as the C.201 prototype.

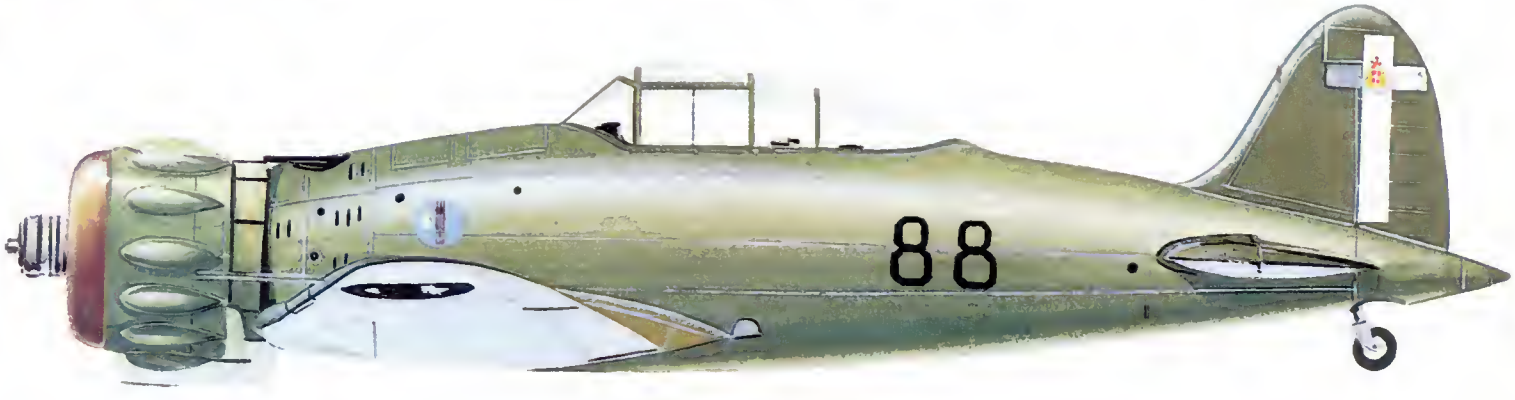
By June 1940, 156 C.200s were in Regia Aeronautica service, (with the name Saetta) though in the initial period of Italy's participation in World War II they were grounded as a result of fatal crashes, many caused by high-speed stalls. The type's main service was in the various theatres around the Mediterranean, though two Gruppi served with the Italian expeditionary force on the Eastern Front. Its poor armament was compensated for by exceptional climb and turn performance. It also proved an adaptable aircraft: early service as an interceptor was followed by employment as a bomber and convoy escort, for which drop-tanks could be fitted to give a 300-km (186-mile) increase in range. The later stages of its career saw it adopting a fighter-bomber role, able to carry a bombload of up to 320 kg (705 lb). Finally, after the Italian armistice of September 1943, a small number served as trainers with the Allied co-belligerent air force.



C.200 Saetta

Type: monoplane fighter
Maker: Aeronautica Macchi; SAI Ambrosini; Società Italiana Ernesto Breda
Span: 10.58 m (34 ft 8½ in)
Length: 8.2 m (26 ft 10¾ in)
Height: 3.51 m (11 ft 6¼ in)
Wing area: 16.8 m^2 (180.84 sq ft)
Weight: maximum 2328 kg (5132 lb); empty 1894 kg (4175 lb)
Powerplant: one 870-hp Fiat A74. RC38 14-cylinder two-row radial
Performance: maximum speed 503 km/h (313 mph) at 4500 m (14 764 ft); range 570 km (354 miles); operational ceiling 8900 m (29 200 ft)
Armament: two 12.7-mm (0.5-in) Breda-SAFAT machine-guns
Crew: 1
Production: 1143

Far left: A C.200 preserved in Italy in the colours of 22° Gruppo Autonomo Spauracchio which served in the USSR in World War II
Left: The prototype C.200 (MM 336) first flown in 1937 and winner of the fighter trials at Guidonia in 1938
Below: An early production C.200, with fully-enclosed cockpit. This machine has the non-retracting tailwheel and no propeller spinner



C.202 Folgore, Macchi

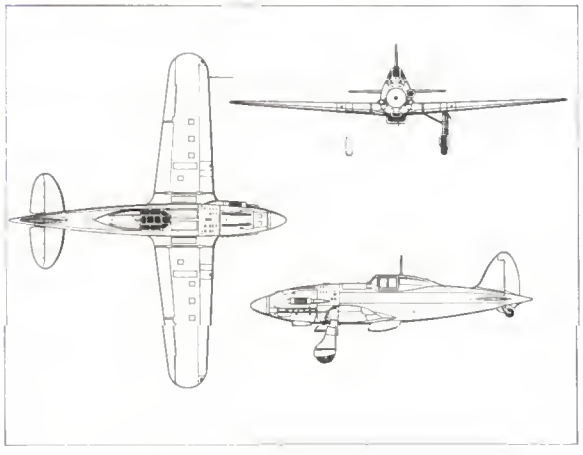
FIRST FLIGHT 1940

Left: A C.202 AS (Africa Settentrionale) Serie III. The Macchi Folgore (Lightning) served in Africa, the USSR and Italy
Below left: A Folgore in Co-Belligerent markings
Below: The C.202 was superior to the Hurricane and P-40 but no match for the Spitfire or P-51

WITH their C.200 Saetta in production for the Regia Aeronautica, Macchi set about realizing the design's full potential by replacing its under-powered Fiat A74 engine with a Daimler-Benz DB 601A-1 to produce the prototype C.202 Folgore. This flew in August 1940, and in trials registered a top speed of 599 km/h (372 mph) – 96 km/h (59.7 mph) better than the production C.200 – while retaining its predecessor's exceptional climb rate and responsiveness. Since it was based on a type in production, assembly lines could *be established relatively quickly.*

Consequently, production of the C.202, both by Macchi and licensees, was authorized. Arrangements were made for licence production of the engine by Alfa Romeo, though deliveries of the powerplant consistently failed to keep pace with demand. The first Folgores entered service in mid 1941, and production continued until September 1943. A total of 11 sub-series were distinguished by variations of detail and equipment, some of the last examples having racks for 100- or 150-litre (22- or 33-Imp gal) drop-tanks or 50-, 100- or 150-kg (110-, 220-, or 331-lb) bombs under the wings. Aircraft of the sixth and subsequent series carried a 7.7-mm (0.303-in) machine-gun in each wing in addition to the Saetta's standard armament of two 12.7-mm (0.5-in) guns in the top of the forward fuselage.

Even greater improvement was offered by the 1475-hp DB 605A-1 engine, and in April 1942 a converted Folgore with this powerplant was flown for the first time. Maximum speed with the new



engine was 642 km/h (399 mph) but, again, production was hampered by shortage of the Italian licence-built version, the Fiat RA1050 RC58 Tifone.

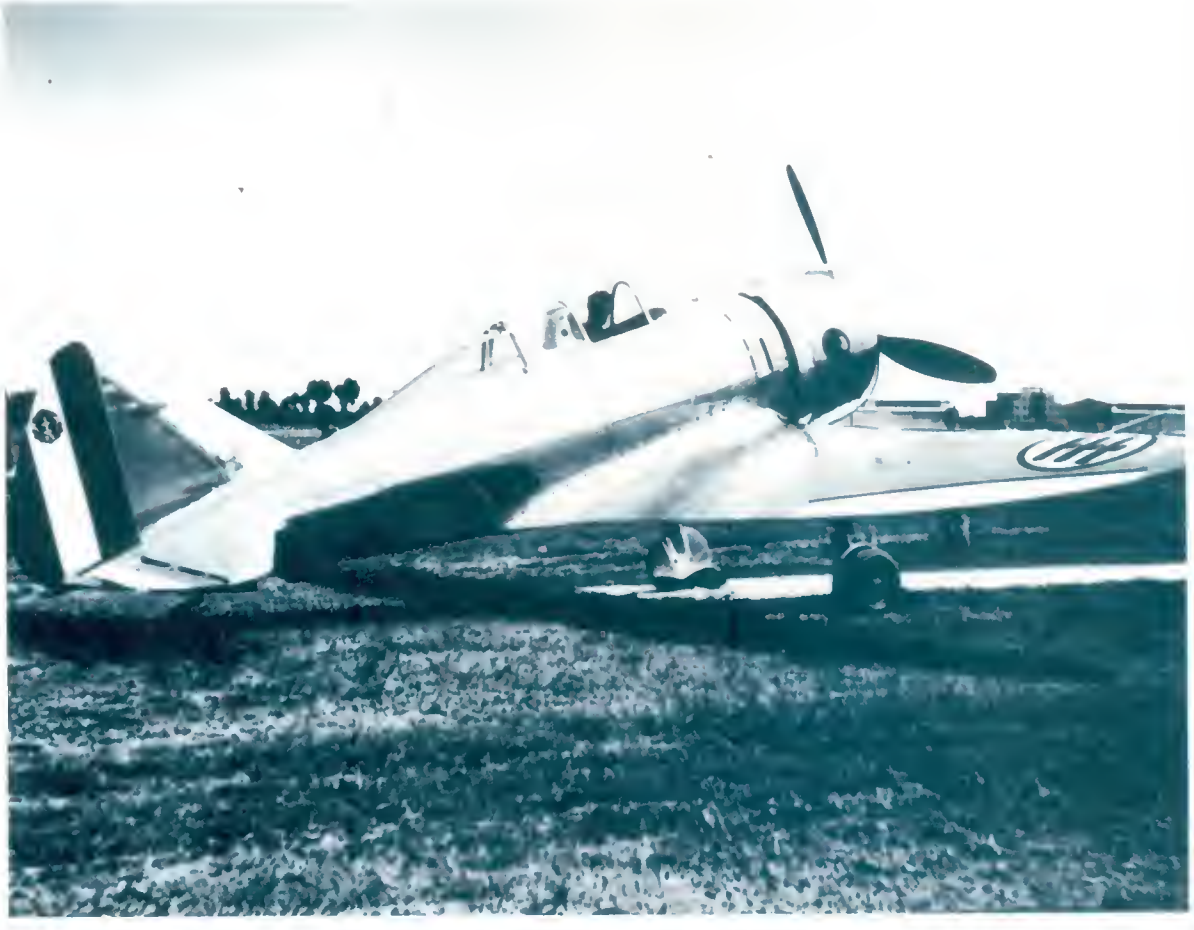
The C.205V Veltro (Greyhound), as the new fighter was designated, made its operational debut in July 1943, but by the time of the Italian armistice in September of that year only 66 were in service. Most of these remained in service with the Repubblica Sociale Italiana air force, and subsequent production of the Veltro brought the total built to 262. Original armament of the type corresponded to that of the bomb-carrying C.202, but the wing machine-guns were replaced on later examples by 20-mm (0.79-in) Mauser MG 151/20 cannon.

C.202 Folgore

Type: monoplane fighter
Maker: Aeronautica Macchi; Societa Italiana Ernesto Breda; SA1 Ambrosini
Span: 10.58 m (34 ft 8½ in)
Length: 8.85 m (29 ft 0½ in)
Height: 3.5 m (11 ft 5¾ in)
Wing area: 16.8 m² (180.84 sq ft)
Weight: loaded 2930 kg (6459 lb); empty 2490 kg (5490 lb)
Powerplant: *one 1075-hp* Alfa Romeo RA1000 RC411 V-12 liquid-cooled engine
Performance: maximum speed 595 km/h (370 mph) at 6000 m (19 685 ft), range 765 km (475 miles); operational ceiling 11 500 m (37 730 ft)
Armament: two 12.7-mm (0.5-in) and two 7.7-mm (0.303-in) Breda-SAFAT machine-guns
Crew: 1
Production: approx 1500

Re 2000, Reggiane

FIRST FLIGHT 1938

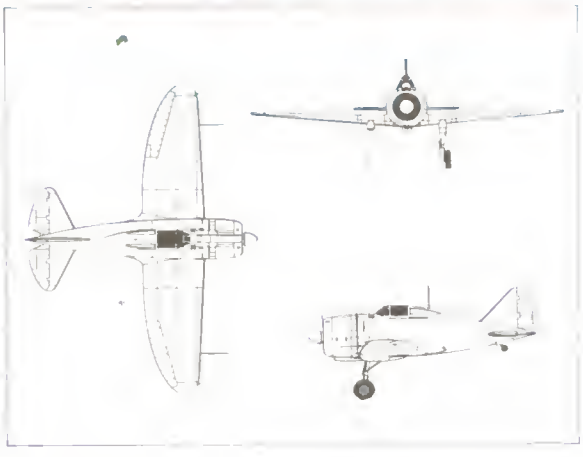


Left: The Re 2000 during the 1938 trials at Guidonia when it was pitted against the Macchi C.200. Flown by Commandante De Bernadi it was superior even to the Bf 109E. The only reservations concerned the supposedly vulnerable wing fuel tanks
Below: A Hungarian Re 2000, known as the Héja and later powered by a Wright Cyclone GR-1280-G2 engine. This installation slightly increased the fuselage length

THE prototype of this, the first of a famous series of fighters, was flown in 1938, only three years after the Officine Meccaniche Italiane Reggiane was taken over by the Caproni organization. It would appear also that the rapidity of its completion was not connected with its pronounced resemblance to the contemporary Seversky P-35. Comparative trials with the Macchi C.200 showed the Falco, as Reggiane named their aircraft, to be superior in handling and performance, but doubts about the vulnerability of the wing-mounted fuel tanks prevented its adoption by the Regia Aeronautica. However, as universal rearmament in 1939 limited availability of modern fighters, the company decided to speculate.

Their judgement was vindicated by an order, in December 1939, from Hungary for 70 complete aircraft together with a manufacturing licence. Deliveries began in April 1940 and the Re 2000 entered Hungarian service as the Héja, though it was late 1942 before MAVAG in Hungary flew their first example. The Hungarian-built aircraft, designated Héja II, used the 930-hp Weiss-Manfred WMK-14 licence-built version of the Gnome-Rhône K14 Mistral Major instead of the unreliable 985-hp Piaggio PXI RC40 installed in the Italian aircraft. Gebauer machine-guns replaced the Italian Breda-SAFATs.

Total Hungarian production was 192, and Héjas served on the Eastern Front during 1942, and thereafter as home-defence fighters and advanced trainers. Sweden was another customer, ordering 60 in November 1940: these were delivered the following year and served as interceptors with the Swedish air force under the designation J20.



Potential orders from other European countries, including Britain, were frustrated by Italy's involvement in the war, and the remaining 38 from the Reggiane production line were used by the Italians. A few were modified with increased fuel tankage in the wings with the object of flying them to Ethiopia, but the collapse of the Italian campaign there frustrated the scheme. More aircraft were fitted with the tanks and based in Sicily in 1941–42, to act as maritime-patrol and escort fighters. Some had catapult hooks but had to land on airfields. Trials were completed successfully, but the curtailment of Italian naval activity prevented their becoming operational.

Re 2000

Type: monoplane fighter
Maker: Officine Mechaniche Italiane Reggiane SA
Span: 11 m (36 ft 1 in)
Length: 7.99 m (26 ft 2½ in)
Height: 3.2 m (10 ft 6 in)
Wing area: 20.4 m² (219.59 sq ft)
Weight: loaded 2880 kg (6349 lb); empty 2070 kg (4563 lb)
Powerplant: one 985-hp Piaggio PXI RC40 14-cylinder two-row radial
Performance: maximum speed 530 km/h (329 mph) at 5000 m (16 404 ft); range 1150 km (715 miles); operational ceiling 9500 m (31 168 ft)
Armament: two 12.7-mm (0.5-in) Breda-SAFAT machine-guns
Crew: 1
Production: 170 (plus 192 Héja)

Re 2001, Reggiane

FIRST FLIGHT 1940

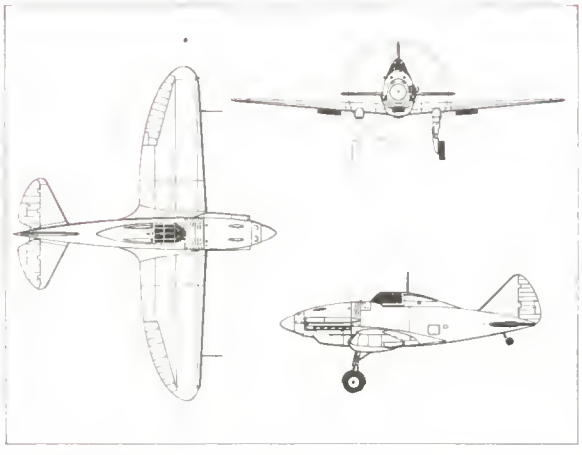
Left: An Re 2001 in desert camouflage – it was also used as a night-fighter painted black
Below left: The Re 2005 entered service in mid 1943, some seeing action in Romania and Germany
Below: An Re 2001 CN (night-fighter) with 20-mm (0.79-in) cannon in underwing gondolas

THE Re 2001 Falco II was produced by combining the German Daimler-Benz DB 601A-1 engine with a refined Re 2000. After promising trials with the prototype in August 1940, new wings were designed to replace the type that had been found unacceptable on the Re 2000.

This was the beginning of a series of new designs, as delays in the supply of licence-built DB 601s by Alfa Romeo led to the substitution of other powerplants. The Re 2002 Ariete (Ram) reverted to a radial engine, the 1175-hp Piaggio P.XIX RC.45. After making its first flight in October 1940 it underwent official trials the following year, and despite problems with the new powerplant a total of 700 were ordered. Again, the engine manufacturers could not keep up with the required production rate, and the final Reggiane design to fly used the 1475-hp DB 605A-1.

The new fighter, the Re 2005 Sagittario (Archer), also introduced a much heavier armament, replacing the twin nose 12.7-mm (0.5-in) and two wing 7.7-mm (0.303-in) machine-guns with a 20-mm (0.79-in) MG 151/20 firing through the propeller hub plus a similar weapon and a 7.7-mm machine-gun in each wing. The prototype was flown for the first time in May 1942 and subjected to official trials in July and August, but in spite of an impressive top speed of 678 km/h (421 mph) at 6950 m (22 802 ft) no production was authorized until the following February.

Meanwhile, deliveries of production Re 2001s had begun in September 1941. When production ended two years later 224 had been built. Of these, 39 2001CBs had a rack below the fuselage for a 640-kg (1410-lb) bomb. Another 124 were completed as night-fighters, with two 20-mm cannon in underwing gondolas. Fourteen were navalized for catapult trials as part of Italy's abortive aircraft-carrier programme. They were used in the Mediterranean in 1942–43, and a few served with the co-belligerent and Repubblica Sociale Italiana air forces after the Italian armistice.



Production Re 2002s began to reach the Regia Aeronautica in mid 1942, and by September 1943, 147 had been completed. Some 40 of these were used by the Co-Belligerent Air Force, and another 76 were built subsequently for the Luftwaffe. Most of the 36 Re 2005s completed were commandeered by the Germans after the armistice.

Re 2002 Ariete

Type: monoplane fighter
Maker: Reggiane; Caproni
Span: 11 m (36 ft 1 in)
Length: 8.16 m (26 ft 9½ in)
Height: 3.15 m (10 ft 4 in)
Wing area: 20.4 m² (219.59 sq ft)
Weight: maximum 3240 kg (7143 lb); empty 2390 kg (5269 lb)
Powerplant: one 1180-hp Piaggio P.XIX RC.45 14-cylinder air-cooled radial
Performance: maximum speed 530 km/h (329 mph) at 5500 m (18 045 ft); range 1100 km (684 miles); operational ceiling 11 000 m (36 089 ft)
Armament: two 12.7-mm (0.5-in) and two 7.7-mm (0.303-in) Breda-SAFAT machine-guns; 950 kg (2095 lb) of bombs or one torpedo under fuselage plus 320 kg (706 lb) under-wing bombs
Crew: 1
Production: 227 (total Re 2001 Falcos, 237)

Buffalo, Brewster

FIRST FLIGHT 1937

Left: A US Navy Brewster F2A-3; only 11 went to the navy, but the Finns took 97 for the war against the Soviet Union
Below left: An F2A-2 of the USN with Felix the Cat painted by the cockpit
Below: A Buffalo in RAF service; they fought a brief and disastrous rearguard action against the Japanese

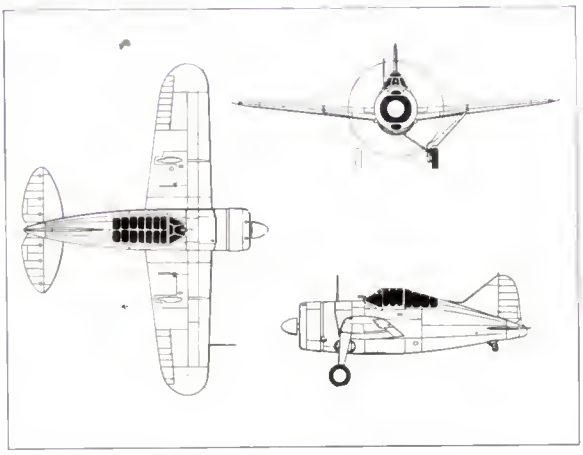
CONSTRUCTED in response to the same US Navy competition of 1935 that gave rise to Grumman's biplane XF4F-1, the Brewster Model 39 was flown for the first time in December 1937 with the designation XF2A-1. Powered by a 950-hp Wright R-1820-22 Cyclone, it underwent a long series of refinements before 54 F2A-1s were ordered in June 1938.

After crashing during landing trials, the prototype was re-engined with a 1200-hp R-1820-40, its first flight in July 1939 coinciding with deliveries of the first production F2A-1s. Subsequently, 43 F2A-2s were built with the new engine, and the final production version for the US Navy, the F2A-3, used the same powerplant. Although the weight of additional armour and equipment reduced speed, ceiling and climb rate, 108 were built.

Only 11 F2A-1s went to the US Navy; the remainder, designated B-239, were sent to Finland, where they fought throughout the war against the Soviet Union. Export models were also produced for Belgium, which ordered 40 B-339Bs in 1939; Britain, which ordered 170 B-339Es the following year; and the Dutch East Indies requested 72 B-339Ds and 20 B-439s later in 1940. The B-339s were equivalent to F2A-2s without naval equipment, and the B-439 was derived from the F2A-3.

After the German invasion of Belgium, most of the B-339Bs were diverted to Britain, where they saw limited service under the name Buffalo I. The B-339Es were delivered to the Far East, where they equipped two Royal Air Force, two Royal Australian Air Force and one Royal New Zealand Air Force squadrons. Most of the aircraft of these and the four Dutch colonial squadrons formed with the type were destroyed over Burma, Singapore, Malaya and Java in the early months of fighting against the Japanese in the weeks following December 1941. Their inferiority to the Japanese fighters, even with all non-essential equipment removed to reduce weight, was such that the survivors, plus a small number diverted to Australia, saw no further operational service.

After brief service aboard US Navy carriers *Saratoga* and *Lexington* in 1940–41, most F2A-3s were used for training, though some saw action over Midway with US Marine Corps squadron VMF-221 in June 1942, when 11 were shot down by fighters escorting a Japanese bomber force.



F2A-3

Type: shipboard fighter
Maker: Brewster Aeronautical Corporation
Span: 10.67 m (35 ft)
Length: 8.12 m (26 ft 7½ in)
Height: 3.47 m (11 ft 4½ in)
Wing area: 19.41 m² (208.9 sq ft)
Weight: maximum 3247 kg (7159 lb); empty 2146 kg (4732 lb)
Powerplant: one 1200-hp Wright R-1820-40 Cyclone 9-cylinder radial
Performance: maximum speed 467 km/h (290 mph) at 5029 m (16 500 ft); range 1553 km (965 miles); operational ceiling 7620 m (25 000 ft)
Armament: four 0.5-in (12.7-mm) Browning machine-guns
Crew: 1
Production: 509 (all Buffalos)

MiG-3, Mikoyan-Gurevich

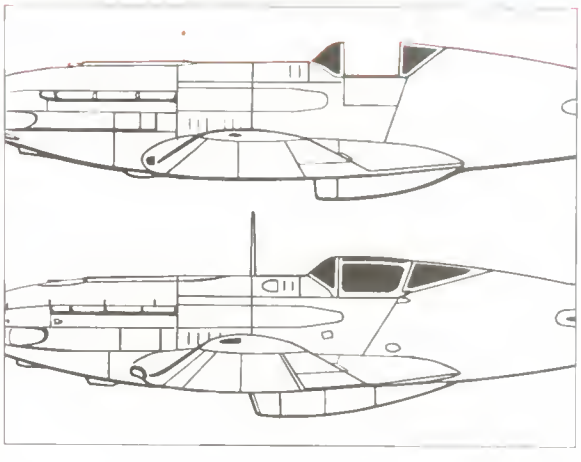
FIRST FLIGHT 1940

THE 1938 VVS (*Voenno-vozdushniye Sily*, or Soviet air forces) requirement for a high-performance, high-altitude fighter was taken up by the new Mikoyan-Gurevich design bureau. Having selected the heavy but powerful Mikulin AM-35A supercharged engine, the designers were forced to use the lightest, and consequently smallest, possible airframe, with the cockpit well aft to balance the engine's weight. Construction was of wood, except for the forward fuselage and wing centre section, and the armament comprised two 7.62-mm (0.30-in) and one 12.7-mm (0.5-in) machine-guns in the nose.

Trials of the prototype MiG-1 in 1940 revealed the impressive level speed of 649 km/h (403 mph) at 6900 m (22 638 ft), but the size constraints had resulted in extremely awkward handling, compounded by limited forward view. Nevertheless, assembly of the production batch of 100 went ahead. However, because of changes to the design, the rate of completion averaged only five per month during the last third of 1940, and the inclusion of the armour protection and armament that had been omitted from the original prototype resulted in a further deterioration of flying qualities. The level speed performance was also reduced, and other deficiencies included lack of range because of limited fuel capacity.

The reports of fighter units and the findings of wind-tunnel tests resulted in such a large number of changes to aircraft built after the first 100, that the new designation MiG-3 was applied.

Among the changes were an increase in fuel capacity, modification of the supercharger intakes and ventral radiator, increased dihedral on the outer-wing panels and the provision of a sliding canopy and extended glazing aft of the cockpit. Production MiG-1s dispensed with the folding canopy of the prototype. A second production line was established, and the first examples of the MiG-3 appeared in March 1941.



Above: MiG-3s of the 12 IAP, the fighter aviation unit assigned to the defence of Moscow in early 1942. The picture was taken when the unit was raised to Guards standard
Left: The prototype MiG-1 was designed with a sideways opening cockpit. This was later replaced by a sliding canopy on production models to allow pilots to fly with the cockpit open

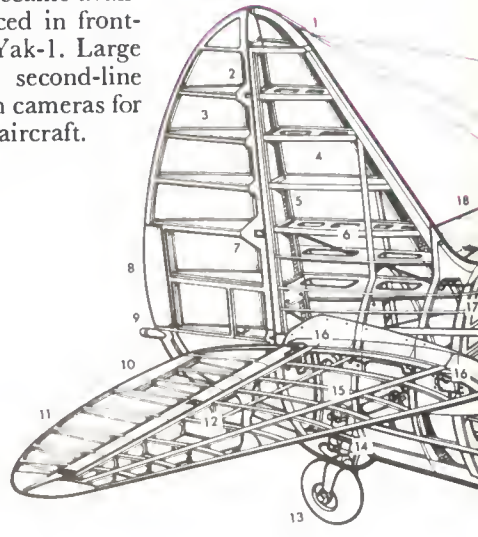
Over 3300 examples were delivered in little more than a year. Unfortunately, although range and handling had been improved, the MiG-3 was at its best at high altitudes, whereas most combat was taking place at lower levels. Although the armament was clearly below standard, the weight of the AM-35A engine was such that there was no scope for carrying more weapons.

There were a number of projected developments of the MiG-3. The MiG-3D was intended to use the 1700-hp AM-39 engine, but when MiG-3 production ended in the spring of 1942, this still had not flown. The imminent termination of AM-35A production towards the end of 1941 resulted in the I-210, with a 1540-hp Shvetsov M-82 radial.

This proved unstable and deficient in performance, and when these problems were solved with the 1650-hp M-82FN-powered I-211, it had been rendered unnecessary by production of the Lavochkin La-5. Subsequent derivatives with later Mikulin engines in the I-220 and I-230 series achieved exceptional speeds.

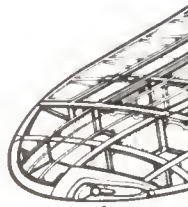
When Germany invaded the Soviet Union in June 1941 a number of fighter divisions had been equipped with the MiG-3, though there was apparently some initial reluctance on the part of less-experienced units even to attempt to fly the type. During the early stages of the war, a combination of poor manoeuvrability, insufficient experience and inadequate low-altitude performance placed the MiG-3 at a considerable disadvantage in combat with the Bf 109E and F.

As an interceptor, moreover, the MiG-3 was hampered in its attacks on bombers by its lack of firepower, and as other new fighters became available the MiG-3 was gradually replaced in front-line formations by the LaGG-1 and Yak-1. Large numbers remained in service with second-line fighter units and many were fitted with cameras for service as high-speed reconnaissance aircraft.

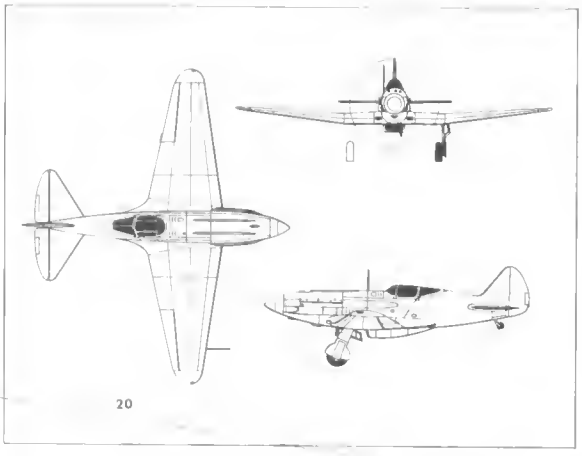


MiG-3

1 Aerial attachment
2 Rudder upper hinge
3 Fabric-covered metal-framed rudder
4 Wooden tailfin structure
5 Rudder post
6 Rudder control cables
7 Rudder centre hinge
8 Rudder tab
9 Rear navigation light
10 Elevator tab
11 Fabric-covered metal-framed elevator
12 Tailplane structure
13 Fixed tailwheel
14 Tailwheel leg fairing
15 Tailwheel shock absorber
16 Tailplane spar attachment points
17 Fuselage aft frame
18 Left elevator
19 Left tailplane
20 Aerials
21 Control cable runs
22 Upper longeron
23 Fueslage stringers
24 Lower longeron
25 Fuselage frame
26 Frame strengthening brace
27 Radio compartment access
28 Aft-vision glazing
29 Pilot's headrest
30 Aft-sliding cockpit canopy
31 One-piece moulded windscreen
32 PBP-1a reflector gunsight
33 Instrument panel shroud
34 Control column
35 Fuselage metal frame
36 Pilot's seat
37 Back armour
38 Fuselage wood/metal construction joint
39 RSI-3 radio receiver
40 Radio equipment rack
41 Fairing attahment
42 Trim handwheels
43 Underfloor fuel tank
44 Wing root fairing
45 Formers
46 Right flap inboard section
47 Flap pushrod
48 Right flap outboard section
49 Rear spar
50 Fabric-covered metal-framed aileron
51 Wing stiffeners
52 Wing outer section ribs
53 Right navigation light
54 Leading-edge ribs
55 Forward spar
56 Mainspar
57 Wing inboard/outboard section attachments
58 Strengthened rib
59 Mainwheel leg pivot
60 mainwheel leg flap hinged upper section
61 Brake line
62 Mainwheel fairing
63 Torque links
64 Right mainwheel
65 Cooling louvres
66 Oleo shock absorber sleeve
67 Inboard leading-edge structure
68 Rib cut-outs
69 Right wing fuel tank
70 Ventral radiator bath
71 Rear spar/fueselage attachment
72 Rudder pedals
73 Bulkhead
74 Fuselage forward fuel tank
75 Fuel filler access
76 Cooling louvres
77 Angled aerial mast
78 Machine-gun breeches
79 Gun cooling intake scoops
80 Ammunition tanks
81 Fuselage forward frame
82 Main spar/fuselage attachment
83 Intake duct
84 Induction air intake
85 Left mainwheel
86 Engine accessories
87 Intake fairing
88 Oil cooler air intake
89 Intake scoop
90 Exhaust stubs
91 Cowling release catches
92 Mikulin AM-35A ½2-cylinder liquid-cooled engine
93 One 7.62-mm (0.30-in) ShKAS machine-gun left and right and one 12.7-mm (0.5-in) UB machine-gun
94 Mainspar (outboard section)
95 Aileron control linkage
96 Aileron tab (left wing only)
97 Left aileron
98 Plywood outer panel wing skinning
99 Left navigation light
100 Forward spar (outboard section)
101 Gun troughs
102 Coolant tank
103 Spinner back plate
104 Reduction gear housing
105 Auxiliary intake
106 V1Sh-22E (later V1Sh-61) all-metal variable-pitch three-blade propeller
107 Spinner

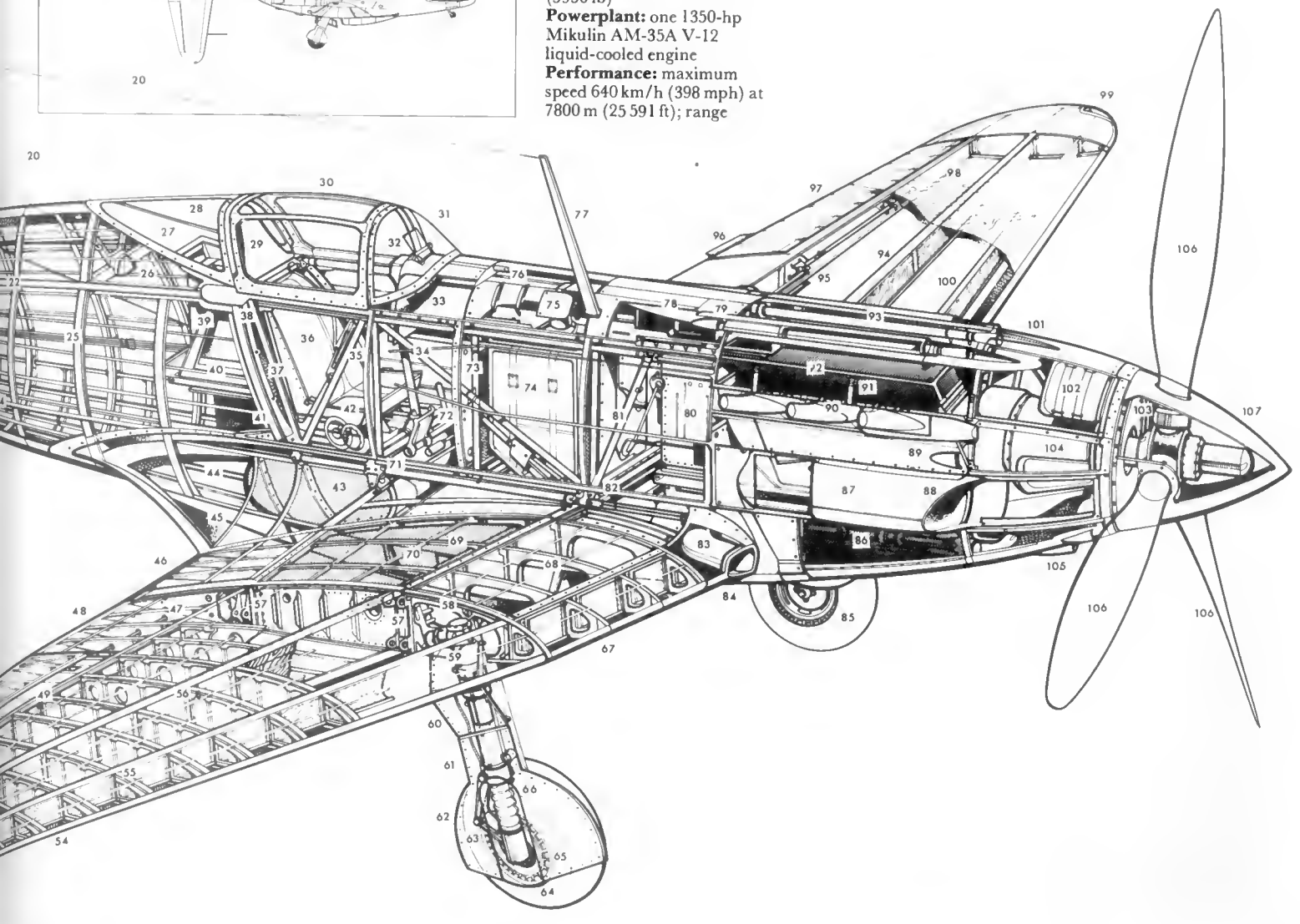


Far left: A MiG-3 in winter camouflage. Pilots complained that, though it could compete with enemy aircraft at 5000 m (16 400 ft), it was no match for fighters at low levels and was heavy on the controls
Left: The MiG-1 differed from the MiG-3 with its hinged cockpit cover, landing-gear leg design and hinged wheel covers. At the time of its introduction into service the Russians claimed that it was the fastest military aircraft in production in the world



MiG-3

Type: single-seat interceptor and reconnaissance aircraft
Maker: State aircraft factories
Span: 10.3 m (33 ft 9½ in)
Length: 8.15 m (26 ft 8¾ in)
Height: 2.62 m (8 ft 7 in)
Wing area: 17.44 m² (187.73 sq ft)
Weight: maximum 3350 kg (7385 lb); empty 2699 kg (5950 lb)
Powerplant: one 1350-hp Mikulin AM-35A V-12 liquid-cooled engine
Performance: maximum speed 640 km/h (398 mph) at 7800 m (25 591 ft); range 1250 km (777 miles); operational ceiling 12 000 m (39 370 ft)
Armament: one 12.7-mm (0.5-in) Berezin UB and two 7.62-mm (0.3-in) ShKAS machine-guns
Crew: 1
Production: 3322



LaGG-3, Lavochkin

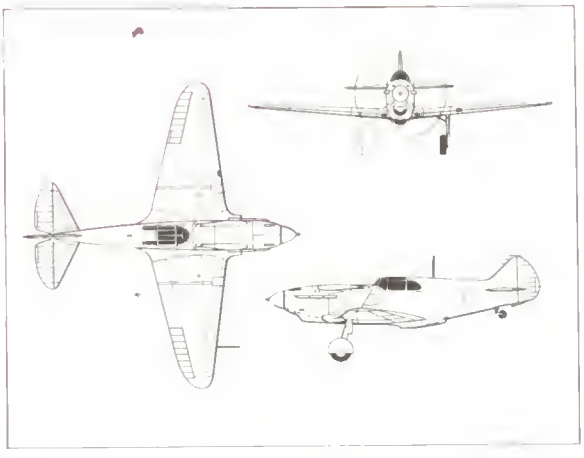
FIRST FLIGHT 1940

THE Soviet air force fighter specifications issued in 1938 for a less specialized tactical machine optimized for combat at around 3500 m (11 483 ft), led to proposals being submitted by the design bureaux of Lavochkin and Yakovlev. These were selected for further development, with the respective designations I-22 and I-26.

The I-22 used the 1100-hp Klimov M-105P engine, with provision for a cannon to be mounted between the cylinder banks, and while the low-wing monoplane configuration was conventional, the all-wood construction used an unorthodox compound birch ply. Metal was used only in the nose, which housed two 12.7-mm (0.5-in) machine-guns, and on movable control surfaces.

The first of a number of prototypes, soon to be designated LaGG-1, flew for the first time at the end of March 1940. It gave a maximum speed of 600 km/h (373 mph) at 5000 m (16 404 ft) but other aspects of performance as well as general flying qualities were extremely poor. However, the pressing need for new fighters, and the fact that the bureau had already established a production line for its design, led to a programme of improvements to salvage the design rather than scrap it.

Amendments to the control systems, lightening of the structure, the use of 7.62-mm (0.30-in) machine-guns and the replacement of the original 23-mm (0.91-in) VYa cannon with a 20-mm (0.79-in) ShVAK, as well as the incorporation of extra fuel tanks in the wings cured the worst of the problems. Production of the revised design designated LaGG-3 began in January 1941.



By the end of the year 2463 examples had been completed, and another 4065 followed before production ended in the second half of 1942. A number of changes were introduced, the major improvement being the 1260-hp M-105PF.

Armament was subject to numerous variations, the original 23-mm cannon often being used, and one or both of the 7.62-mm machine-guns being replaced by the 12.7-mm BS. Standard external stores attachment points allowed six RS-82 rockets, up to 200 kg (441 lb) of bombs or an additional pair of machine-guns to be carried under the wings, with the alternative of drop-tanks for escort missions. At one stage a new version mounting a 37-mm (1.46-in) cannon was considered. Other abortive developments included using more powerful

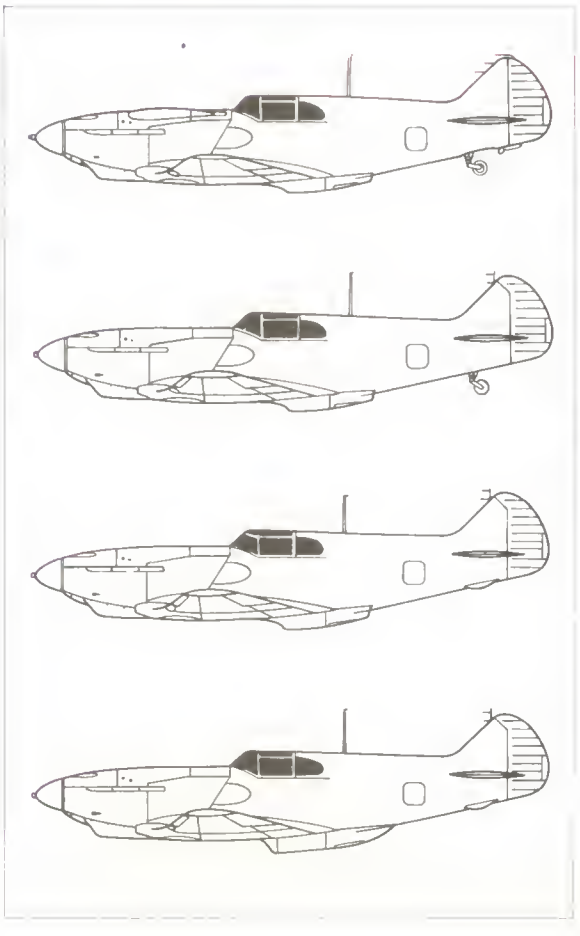
LaGG-3

Type: tactical fighter
Maker: State aircraft factories
Span: 9.8 m (32 ft 2 in)
Length: 8.81 m (28 ft 11 in)
Height: 4.4 m (14 ft 5¼ in)
Wing area: 17.5 m² (188.37 sq ft)
Weight: maximum 3180 kg (7231 lb); empty 2620 kg (5776 lb)
Powerplant: one 1100-hp Klimov M-105P or 1260-hp M-105PF V-12 engine
Performance: maximum speed 570 km/h (354 mph) at 4000 m (13 123 ft); range 700 km (435 miles) with drop-tanks; operational ceiling 9600 m (31 496 ft)
Armament: one 23-mm (0.91-in) Volkov VYa-23 or 20-mm (0.79-in) Shpitalny ShVAK cannon; two 7.62-mm (0.3-in) ShKAS or 12.7-mm (0.5-in) UB machine-guns; two 100-kg (220-lb) bombs or six RS-82 rockets
Crew: 1
Production: 6528

Klimov engines and fitting a ramjet booster.

The service introduction of the LaGG-3 in the first half of 1941 caused general dismay among the pilots called upon to fly it. The basic shortcomings of early models was compounded by poor finishing of production examples. In combat, the type proved markedly inferior to contemporary German fighters, and even the soundness of its construction was vitiated by the vulnerability of the radiator and wing tanks and the minimal armour protection for the pilot.

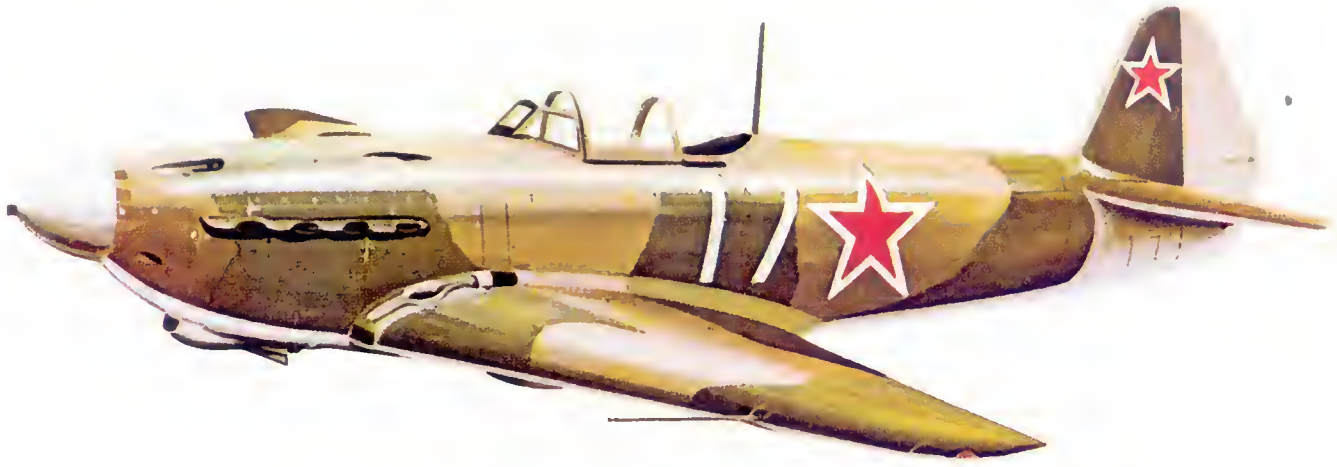
After being switched in increasing numbers to the ground-attack role, to which it proved better suited, the LaGG-3 was replaced in both production and service from 1942 by the radial-engined La-5.



Top: The LaGG-3 was built extensively from plywood with bakelite bonding agents between layers of birch skin
Above left: A captured aircraft evaluated by the Finns
Left: The top two aircraft are early production versions with rudder and fuselage-gun modifications and fixed tailwheel. The lower two have improved windscreens and the bottom aircraft is fitted with an extended radiator duct
Above: The single 20-mm cannon of the LaGG-3 was mounted between the engine cylinder blocks

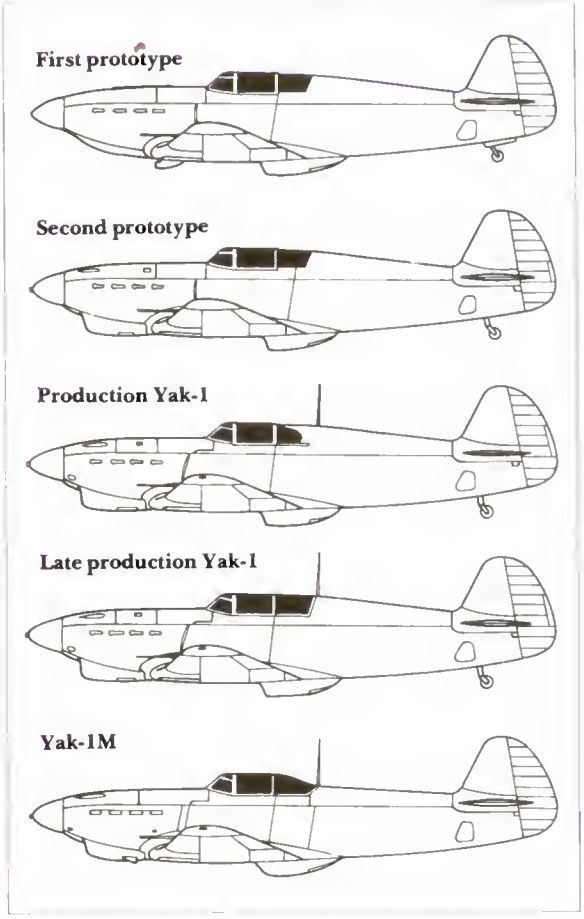
Yak-1, Yakovlev

FIRST FLIGHT 1940

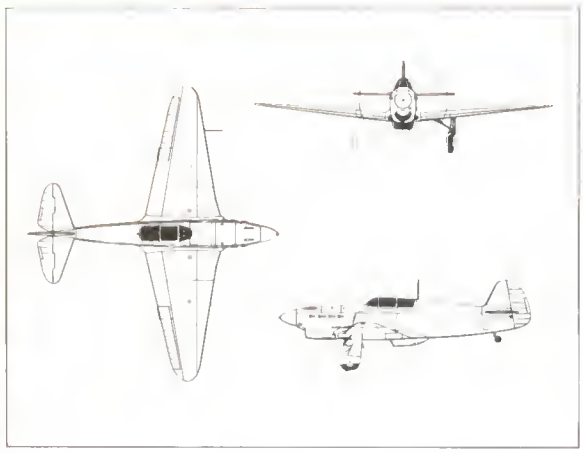


THE Yakovlev I-26, ordered along with the Lavochkin I-22 (LaGG-1) as a prototype low-level tactical fighter at the beginning of 1939, began flight tests in March 1940. Like its counterpart from Lavochkin, the I-26 used the 1100-hp Klimov M-105P engine with 20-mm (0.79-in) cannon firing through the propeller hub. Two 7.62-mm (0.30-in) ShKAS machine-guns were fitted above the cowling. Though wood was used in its construction it was confined to the wings, which also carried the fuel tanks, the fuselage being of welded steel tubes. Service evaluation began in June 1940, and by October deliveries had begun of pre-series aircraft. The early examples proved slightly heavier, and consequently slower than expected. But performance was good enough for production to begin almost immediately under the designation Yak-1.

By the end of the year a total of 64 had been completed, and another 335 followed in the first half of 1941. Early production was accompanied by the development of a lightened airframe with boosted 1260-hp M-105PF engine, flown in June 1941, demonstrating an increase in top speed from 540 km/h (336 mph) to 580 km/h (360 mph). Before production of the new model could gather momentum, however, the factory was evacuated from the Moscow area, but production was resumed rapidly at new factories in the east. By this time the two machine-guns had been replaced by a single 12.7-mm (0.5-in) UB, and from January 1943 a new cockpit canopy with improved rear view was introduced to produce the Yak-1M,



Top: The Yak-9D was the long-range version
Centre left: The Yak-1M prototype
Centre right: The Yak-1M had improved rear view
Above: A Yak-3 squadron; this close dogfighter was derived from the lightweight Yak-1M. Though lightly armed and armoured by western standards, it handled superbly and was superior to the Bf 109G and Fw 190A at low and medium altitudes
Left: Variations of the Yak-1



Top: A Yak-9D flown by M V Avdyeyev of an élite Guards Regiment over the Crimea in May 1944. The fin bears his six kills while the nose has the Guards badge and Order of the Red Banner (Military)
Above: A Yak-9P captured in the Korean war and flown by the USAF for evaluation
Left: The Yak-9U was virtually a new aircraft with an all-metal skin. It saw action in the closing months of the war and equipped Soviet satellite countries after the war

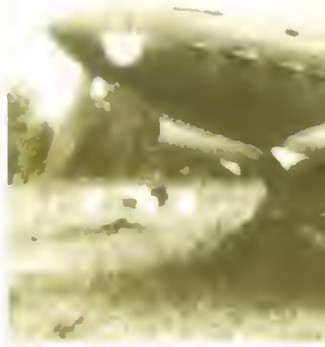
Yak-3

Type: tactical fighter
Maker: State aircraft factories
Span: 9.2 m (30 ft 3 in)
Length: 8.5 m (27 ft 11 in)
Height: 2.96 m (9 ft 8½ in)
Wing area: 14.85 m^2 (159.8 sq ft)
Weight: loaded 2660 kg (5864 lb); empty 2105 kg (4641 lb)
Powerplant: one 1290-hp Klimov VK-105PF-2 liquid-cooled engine
Performance: maximum speed 655 km/h (407 mph) at 3300 m (10 820 ft); range 900 km (560 miles)
Armament: one 20-mm (0.79-in) Shpitalny ShVAK cannon; two 12.7-mm (0.5-in) Berezin UBS machine-guns
Crew: 1
Production: 4848 (all Yak-3s)

which also used a new wing which increased wing span to 10.25 m (33 ft 7½ in).

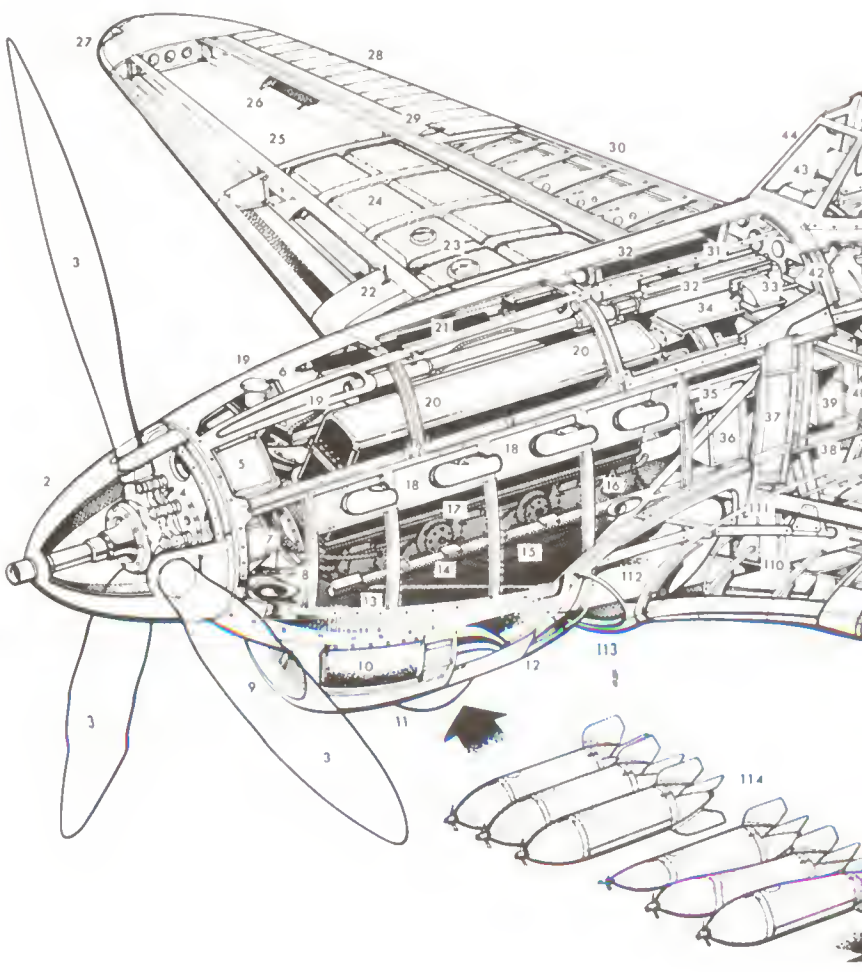
Before production of the Yak-1 had begun, a UTI-26 two-seat trainer version was built. This carried only a single rifle-calibre machine-gun, and had the increased-span wing used on later Yak-1s. The desirability of a conversion trainer led to production of this version, designated Yak-7V and using the M-105PF engine, beginning in 1941. The success of the Yak-7V ensured that a single-seat version was developed, armament of which was increased to include two 12.7-mm machine-guns as well as the 20-mm cannon. Extra fuel was carried in the rear cockpit space, and aerodynamic refinement led to maximum speed being increased to 613 km/h (381 mph), and production of the Yak-7 single-seater began in early 1942. By the second half of the year production had switched to the improved Yak-7B single-seater which used the Yak-1M cockpit canopy.

A variety of derivatives of the Yak-7 were produced. The two-seat Yak-7K omitted the dual controls and was used for liaison; some Yak-7Vs had a fixed landing gear which could be fitted with skis. Experimental versions were tested with radial engines, underwing ramjets, pressurized cabins and 37-mm (1.46-in) anti-tank cannon. The most important derivative however, was the Yak-7D, flown in July 1942, which had a new wing of light-alloy structure and enlarged fuel capacity. Pre-series examples were built with the designation Yak-7D1, but when full-scale production started in

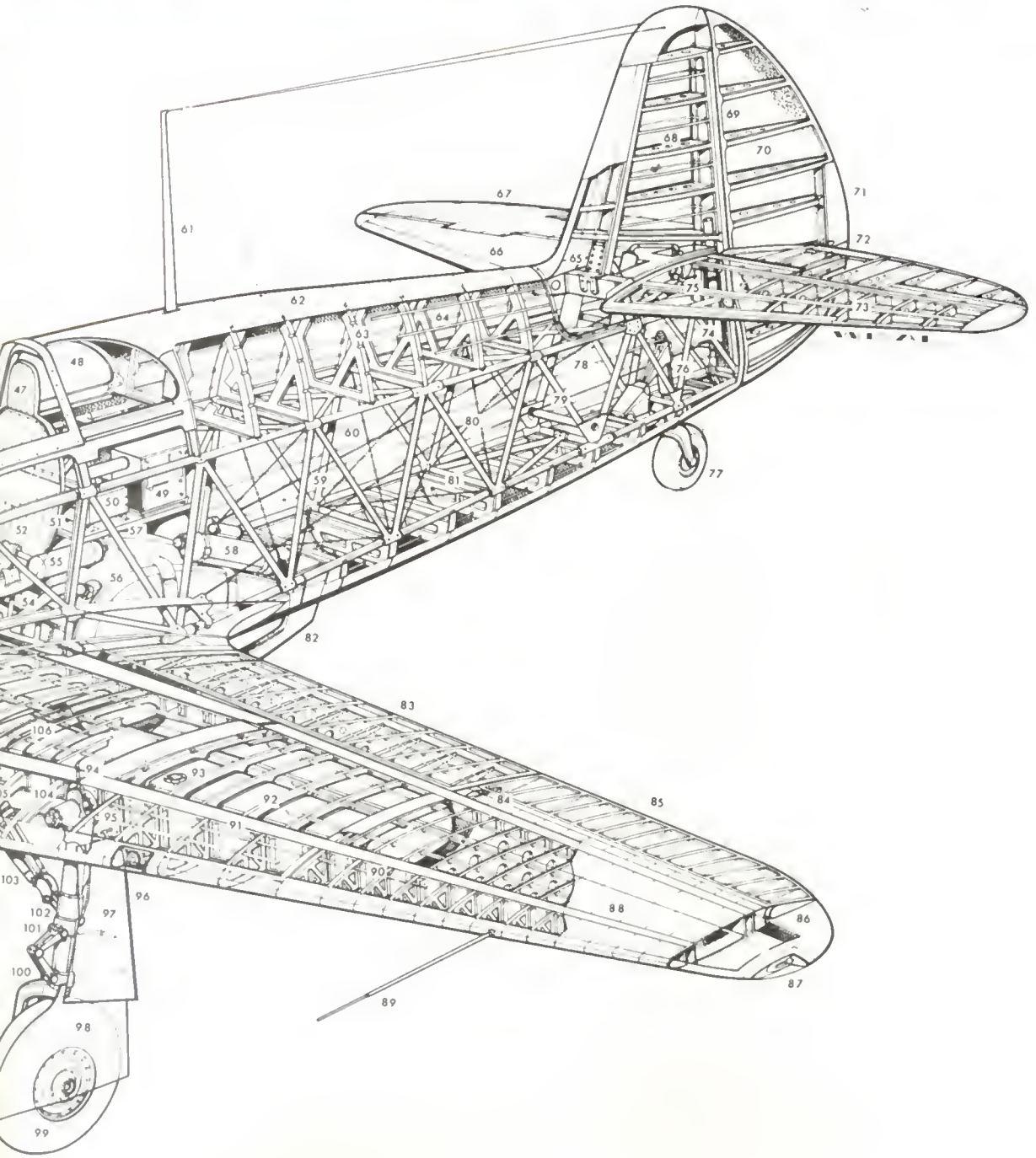


Yak-1

1 Muzzle of 30-mm (0.79-in) Shpital'ny-Vladimirov cannon
2 Propeller spinner
3 VISh-61P variable-pitch metal propeller
4 Pitch control mechanism
5 Engine coolant tank
6 Filler cap
7 Electrical distributors
8 Auxiliary intake scoop
9 Oil cooler intake
10 Oil cooler
11 Right mainwheel
12 Radiator outlet
13 Cowling lower panel line
14 Engine bearers
15 Coolant piping
16 Outlet
17 Klimov M-105PF liquid-cooled V-12 engine
18 Ejector exhaust stubs
19 Gun troughs
20 Cowling frames
21 Blast tubes
22 Right mainwheel leg position indicator
23 Fuel filler cap
24 Right outboard fuel tank
25 Plywood wing skinning
26 Box spar structure
27 Right navigation light
28 Right metal-framed fabric-skinned aileron
29 Aileron hinge fairing
30 Flap profile
31 Gun cocking mechanism
32 Shpital'ny-Komaritsky 7.62-mm (0.30-in) machine-gun (left and right)
33 Ammunition feed (375 rpg)
34 Gun support tray
35 Breech of 20-mm (0.79-in) Shpital'ny-Vladimirov cannon
36 Oil tank
37 Mainspar/fuselage forward frame member
38 Spar/fuselage attachment bracket
39 Ammunition box
40 Rudder pedal assembly
41 Control column
42 Instrument panel
43 PBP-1a reflector sight
44 Optically-flat armourglass windscreen
45 Aft-sliding (non-jettisonable) canopy
46 Turnover bar
47 Armoured headrest
48 Cockpit aft glazing
49 Accumulator
50 Single-channel RSI⅛-3 radio
51 Back armour
52 Pilot's seat
53 Harness
54 Rear-spar carry-through frame
55 Oxygen cylinder
56 Coolant radiator housing
57 Radio equipment bay
58 Tail fin front spar
59 Welded steel-tube fuselage frame
60 Diagonal brace wires
61 Aerial mast
62 Plywood decking
63 Dorsal wooden formers
64 Stringers
65 Tail fin attachment bolts
66 Right tailplane
67 Right elevator
68 Tail fin structure
69 Rudder post
70 Rudder structure
71 Rudder trim tab
72 Elevator trim tab
73 Tailplane structure
74 Rudder control horn
75 Elevator control horn
76 Tailwheel oleo shock absorber
77 Non-retractable tailwheel
78 Wooden side stringers
79 Lifting tube
80 Elevator control cables
81 Ventral wooden formers
82 Radiator bath
83 Inset flap structure
84 Aileron control hinge
85 Aileron structure
86 Left wingtip/aileron profile
87 Navigation light
88 Wing skinning
89 Pitot tube
90 Leading-edge rib cut-outs
91 Forward wooden boxspar
92 Left outboard fuel tank
93 Fuel filler cap
94 Left wheel leg indicator
95 Mainwheel leg attachment plate
96 Landing light
97 Mainwheel leg fairing
98 Mainwheel door fairing
99 Left mainwheel
100 Axle fork
101 Torque links
102 Mainwheel oleo leg
103 Retraction/downlock strut
104 Pivot point
105 Retraction cylinder
106 Ventral radiator intake
107 Left inboard fuel tank
108 Inboard rib
109 Rib cut-outs
110 Mainwheel well
111 Engine bearer/fuselage forward frame attachment
112 Carburettor intake duct
113 Wing root carburettor air intake
114 RS-82 rocket fragmentation missiles (three per wing)



Left and far left: The Yak-1 was named *Krasavec* (beauty) and was so successful that its designer Alexander S Yakovlev was awarded the Order of Lenin, 100 000 roubles and a Zis car. The fabric-covered plywood skin was coated with a thick layer of polish to give a very smooth finish



the second half of 1942 this was changed to Yak-9. Compared with its predecessor, the Yak-9 had increased range and a better rate of climb, though armament was reduced by the omission of one of the machine-guns.

The Yak-9 was to remain in production for five years, and the 16 769 examples completed in this period included a number of variants. These included the Yak-9PVO with night-flying equipment; the Yak-9D and -9DD with progressively increased fuel capacity; the Yak-9T and -9K, which entered production in 1943 with, respectively, 37-mm or 45-mm (1.77-in) anti-tank guns and wing racks for hollow-charge bombs; and the Yak-9B fighter-bomber of 1944, which carried an internal bombload of four 100-kg (220-lb) bombs. The final series began with the Yak-9U, which entered production in 1944 using the 1650-hp M-107A and had a top speed of 675 km/h (419.4 mph) at 5500 m (18 045 ft). The 3900 members of this series included the all-metal Yak-9UT and its -9UV two-seat trainer counterpart; the Yak-9T-45 with 45-mm cannon; and the postwar Yak-9P, which carried all-weather equipment and instruments.

Meanwhile, by the end of 1942 a Yak-1M had been adapted to take a new wing of reduced span and mixed construction, and with a 1300-hp M-105PF-2 engine and various aerodynamic improvements this demonstrated a speed of 680 km/h (422.5 mph) at 3700 m (12 139 ft). Production did not begin until late 1943, and a comparatively modest total of 4848 were completed in this series. However, the Yak-3, as the type was designated, proved an outstanding low-level fighter and was the vehicle for some remarkable achievements in combat. The M-107A-powered Yak-3U version was produced from late 1944 and although too late to see combat before the end of the war, it was often rated the best close-combat fighter of its type in the world. Small numbers were also built of the Yak-3T and the Yak-3P, with three 20-mm B-20 cannon in place of the standard armament of one 20-mm and two 12.7-mm weapons, while a postwar derivative was the Yak-11 basic trainer.

Although attempts to improve the high-altitude performance of the various wartime Yakovlev fighters met with repeated failure, this was outside the scope of the original design, testimony to whose soundness can be found in the variety of specialized roles for which it was adapted and the fantastic production total of over 36 000. The later models saw postwar service with the air forces of Soviet allies, many of which were still flying their Yaks in the late 1950s.

The Yak-9 was a second-generation fighter compared to earlier Yakovlev designs. It was one of the first Soviet fighters to be compared favourably with Western designs with its all-metal construction. The Yak-9U was fitted with additional navigational and radio equipment, and was recognizable by a transparent panel in the rear fuselage covering a direction-finding loop.

The Yak-9 remained in service with satellite air forces and many first line units of the Soviet Air Force into the early 1950s, as well as the French Groupe de Chasse GC 3 during World War II.

Above: A production line for Yak-7Bs, in a plant at Kuybishev to which the original factory was evacuated in late 1941. Only six weeks' output was lost in the giant move
Left: A Yak-3 of the Free French Normandie-Niemen Regiment. The French pilots preferred the Russian fighter to any other Allied type, being easier to fly, though with poor radio equipment and a rudimentary reflector sight

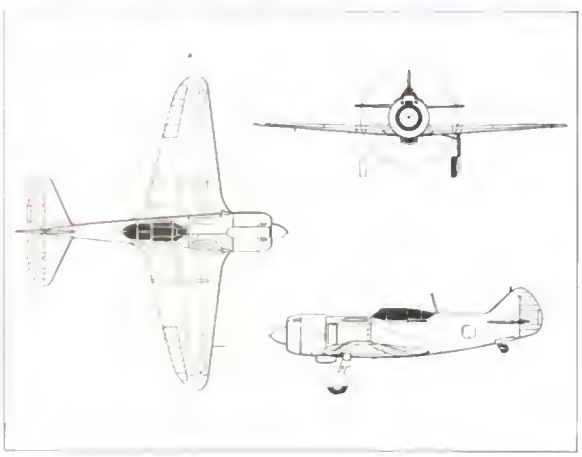
La-5, Lavochkin

FIRST FLIGHT 1942

IN an attempt to improve the LaGG-3, the Lavochkin team took the drastic step of replacing the liquid-cooled engine with the 1600-hp Shvetsov M-82. Although the substitution of this shorter, wider and heavier radial involved numerous problems, the installation was outstanding, and very similar both to that of the Fw 190 and the Hawker Tempest II of two years later. The additional weight was compensated for by the extra power available and the elimination of the cooling system required for the original engine. However, the concentration of engine weight changed the centre of gravity to the extent that nose armament could be increased to two 20-mm (0.79-in) ShVAK cannon.

Tests of the prototype conversion began in March 1942, and the results, including substantially improved performance, were such that in July it was decided to convert all incomplete LaGG-3s to take the radial engine. Range was still short, and it took several months for major defects to be eradicated, but the LaGG-3's intractability had been replaced by outstanding manoeuvrability. By the end of the year production was in full swing. The designation was La-5.

Several modifications were made to the basic aircraft in the course of production. When old LaGG-3 airframes had been used up, an improved cockpit canopy was fitted, and the 1650-hp M-82F replaced the earlier model. In 1943 the fuel arrangement was changed to solve the problem of the unsatisfactory wing tanks, and power was further boosted by the use of the direct-injection M-82FN, this model being designated La-5FN. Towards the end of the year, with the easing of the alloy shortages that had dictated its wooden construction, an La-5 was fitted with a new wing incorporating metal structural members. The reduced structural bulk allowed an increase in fuel capacity, and during 1944 the new wing was introduced on production La-5FNs.



At the same time, a more extensive modification of the design resulted in the new designation La-7. This used the new wing as well as a refined engine installation and various detail improvements which raised top speed to 680 km/h (423 mph) at 3000 m (9843 ft). From the spring of 1944 it supplanted the La-5FN in production. Developments included experimental rocket-boosted and

La-5FN

Type: fighter-bomber
Maker: State aircraft factories
Span: 9.68 m (31 ft 9 in)
Length: 8.7 m (28 ft 7 in)
Height: 2.54 m (8 ft 4 in)
Wing area: 17.51 m^2 (188.37 sq ft)
Weight: loaded 3360 kg (7400 lb); empty 2605 kg (5743 lb)
Powerplant: one 1850-hp ASh-82FN (M-82FN) 14-cylinder two-row radial
Performance: maximum speed 648 km/h (402 mph) at 5000 m (16 404 ft); range 765 km (475 miles); operational ceiling 10 000 m (32 808 ft)
Armament: two 20-mm (0.79-in) ShVAK cannon; six 82-mm (3.2-in) RS-82 rockets or 200 kg (441 lb) of bombs
Crew: 1
Production: approx 20 000 (all La-5 types)

Above: The La-5 was a popular aircraft with both pilots and groundcrews. The air-cooled engine was easy to maintain in sub-zero winter temperatures. The first aircraft to see action were flown by factory pilots at the Battle of Stalingrad in late 1942

Above: A Soviet pilot starts his pre-take-off checks in an La-5FN
Right: The La-5FN was so designated because of its *forsirovannii nyeposredstvenny* or boosted engine. It was powered by an ASh-82FN with direct fuel injection
Centre right: La-5FN fighters open up their engines on a rough strip on the Eastern Front. Groundcrew wait, ready to pull away the chocks. This fighter enjoyed immense popularity, and was flown by several aces from the summer of 1943

supercharged models, while some examples carried three lightweight B-20 20-mm cannon.

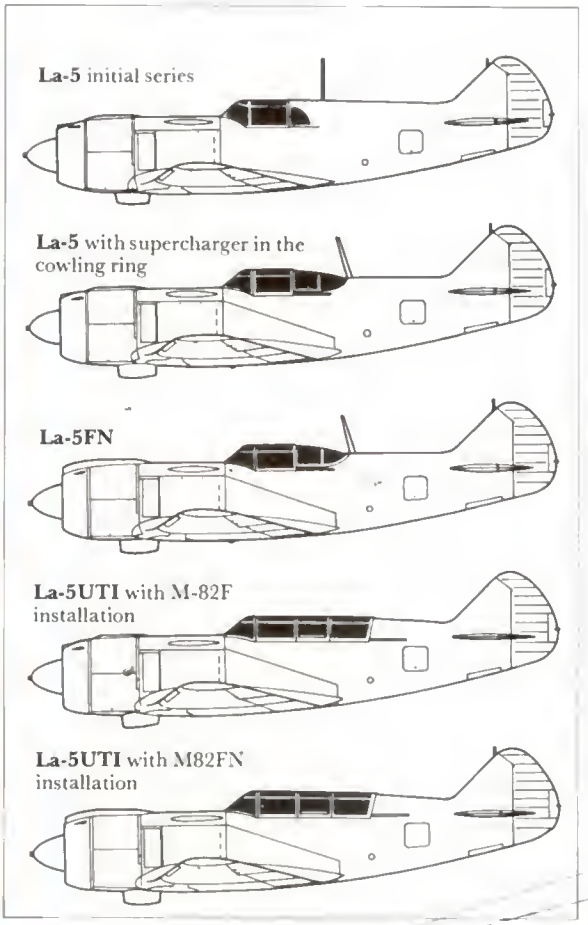
Towards the end of the war a major redesign resulted in the all-metal La-9, using the re-designated ASh-82FNV engine and armed with four 20-mm cannon. This remained in production after 1945, and was followed by the last of the line, the postwar La-11.

While the LaGG-3 had been at a severe disadvantage in aerial combat with the German Bf 109s, the appearance of its radial-engined successor enabled the Soviet pilots to turn the tables on both the Messerschmitt fighter and the Fw 190. Its limited range was slowly increased by augmenting the fuel capacity, and its manoeuvrability could not be equalled by any of its opponents. Other virtues shared by the La-5 and its successors included durability and ease of maintenance, vital attributes on the Eastern Front. All members of the series could carry RS-82 rockets or light bombs under the wings, and hollow-charge anti-tank bombs were often carried on close-support missions.

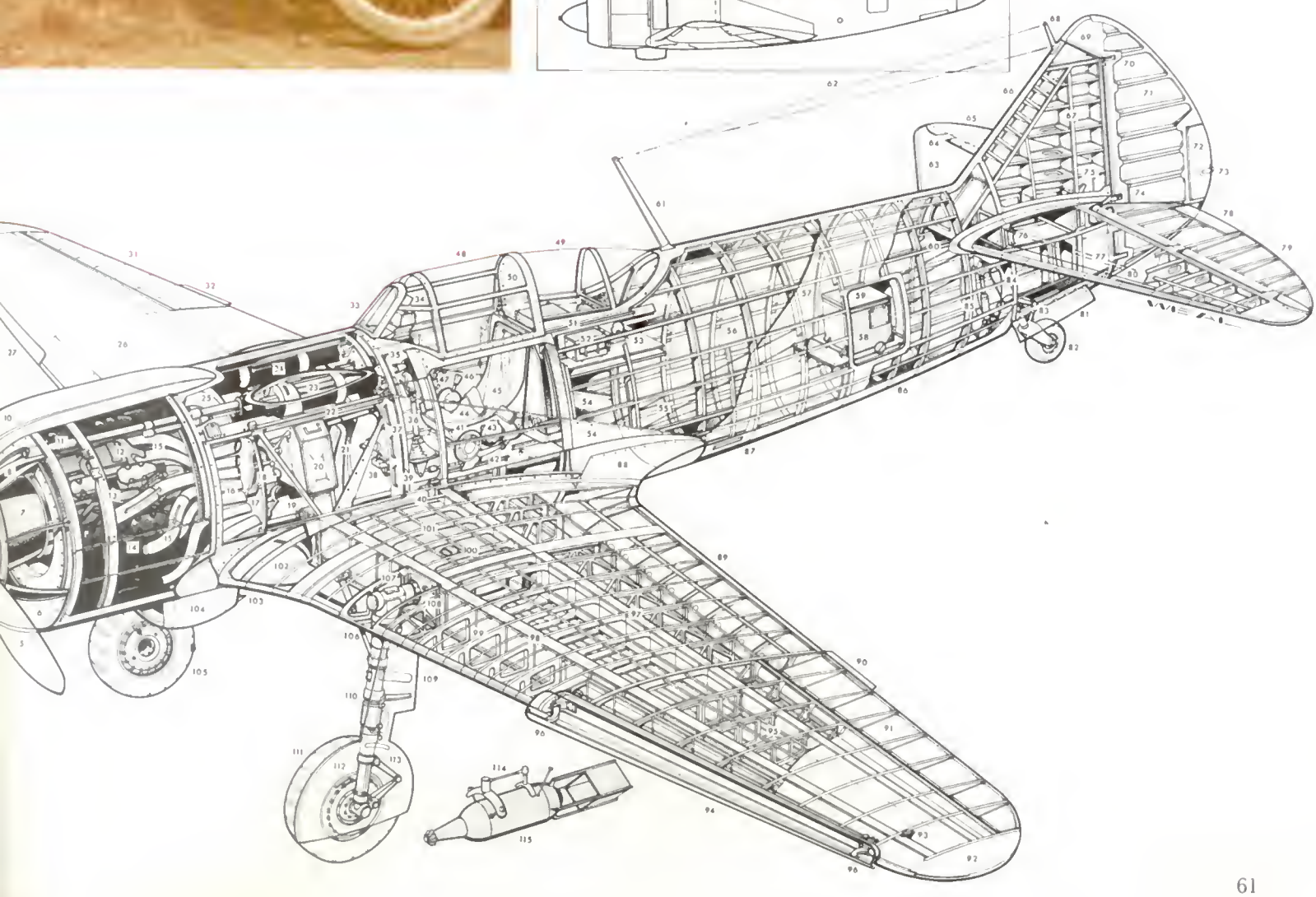
The La-9 was too late to see much combat during World War II, but both it and the La-11 which succeeded it saw widespread service with the air forces of the Soviet Union and its allies, receiving the respective NATO codenames Fritz and Fang. Two-seat trainer versions were produced of all members of the series, these being distinguished by the suffix UTI. Combined production of the La-5 and La-7 reached a total of some 26 000.

La-5FN

1 Hucks-type starter dog
2 Spinner
3 Propeller balance
4 Controllable frontal intake louvres
5 VISh-105V metal controllable-pitch three-blade propeller
6 Nose ring profile
7 Intake centrebody
8 ShVAK cannon left
9 Supercharger air intake
10 Supercharger intake trunk fairing
11 Blast tube
12 Shvetsov M-82FN 14-cylinder two-row radial
13 Cowling ring
14 Cowling panel hinge line
15 Exhaust pipes
16 Exhaust outlet cluster (seven per side)
17 Outlet cover panel
18 Engine accessories
19 Mainspar/fuselage attachment
20 Ammunition tanks (200 rpg)
21 Link and cartridge ejection chutes
22 Engine bearer upper support bracket
23 Cannon breech fairing
24 Paired 20-mm (0.79-in) ShVAK cannon
25 Supercharger intake trunking
26 Stressed bakelite-ply skinning
27 Automatic leading-edge slat (obliquely-operated)
28 Pitot head
29 Right navigation light
30 Wingtip
31 Dural-framed fabric-covered aileron
32 Aileron trim tab
33 Armourglass windscreen
34 PBF-1a reflector gunsight
35 Cockpit air
36 Control column
37 Outlet louvres
38 Rudder pedal assembly
39 Underfloor control linkage
40 Rear spar/fuselage attachment
41 Rudder and elevator trim handwheels
42 Seat height adjustment
43 Boost controls
44 Seat harness
45 Pilot's seat
46 Throttle quadrant
47 Hydraulics main valve
48 Aft-sliding cockpit canopy
49 Fixed aft transparent cockpit fairing
50 Armourglass screen
51 Canopy track
52 RSI-4 HF R/T installation
53 Radio equipment shelf
54 Dural fuselage side panels
55 Control cables
56 Plywood-sheathed birch frames with triangular-section wooden stringers
57 Stressed bakelite-ply skinning
58 Accumulator
59 Accumulator access panel
60 Tailfin frontspar attachment
61 Aerial mast
62 Radio aerials
63 Right tailplane
64 Elevator hinge
65 Dural-framed fabric-covered elevator
66 Tailfin leading edge
67 Tailfin wooden structure (plywood skinning)
68 Aerial stub
69 Rudder balance
70 Rudder upper hinge
71 Dural-framed fabric-covered rudder
72 Rudder trim tab
73 Rear navigation light
74 Rudder centre hinge
75 Elevator control lever
76 Tailplane/fuselage attachment
77 Rudder control lever
78 Elevator trim tab
79 Dural-framed fabric-covered elevator
80 Wooden two-spar tailplane structure (plywood skinning)
81 Tailwheel doors
82 Aft-retracting tailwheel (usually locked in extended position)
83 Tailwheel leg
84 Tailwheel shock strut
85 Retraction mechanism
86 Stressed bakelite-ply skinning
87 Retractable access step
88 Wing root fillet
89 Dural-skinned flap construction
90 Aileron tab
91 Dural-framed fabric-covered aileron
92 Wingtip
93 Left navigation light
94 Leading-edge automatic slat (obliquely operated)
95 Outboard ribs
96 Automatic slat actuating mechanism
97 Rear boxspar
98 Forward boxspar
99 Leading-edge ribs
100 Fuel filler cap
101 Left fuel tank of three tank set
102 Mainwheel well
103 Oil cooler outlet flap
104 Engine oil cooler intake
105 Right mainwheel
106 Landing gear hydraulic jack and ram
107 Landing gear knuckle joint
108 Landing gear/front spar attachment
109 Mainwheel leg fairing plate
110 Mainwheel oleo leg
111 Left mainwheel
112 Mainwheel fairing plate
113 Torque links
114 Underwing stores shackles
115 50-kg (110-lb) bomb



Left: The initial version of the La-5 converted from the LaGG-3 airframe suffered from excessive vibration. After grounding they were altered and pilots reported the improved aircraft to be highly manoeuvrable and also to have the rugged airframe of the LaGG-3. The two-seater versions designated *uchebnotrenirovochny istrebitel*, or instructional training fighter, shortened to UTI were used for training and as high-speed liaison aircraft



P-39 Airacobra, Bell

FIRST FLIGHT 1938

Top: The P-39 combined a mid-mounted engine, car type doors and a nosewheel
Above: P-39Cs on patrol just before Pearl Harbor
Right: A line up of fire-power – the 37-mm (1.46-in) cannon mounted in the nose of the Airacobra. Together with machine-guns and a bomb it made it an effective attack aircraft

THE Airacobra was the Bell company's second fighter, a single-engined single-seater which introduced many novel features. Its configuration stemmed largely from the decision to use the new M4 37-mm (1.46-in) cannon positioned on the fuselage centreline; accordingly, the engine, a turbo-supercharged 1150-hp Allison V-1710-17, was sited behind the cockpit, on the centre of gravity. The propeller was driven through an extension shaft and reduction gearing, leaving the nose free for a heavy cannon firing through the propeller hub, a pair of 12.7-mm (0.5-in) machine-guns and the retracting front leg of a tricycle landing gear, then a novelty.

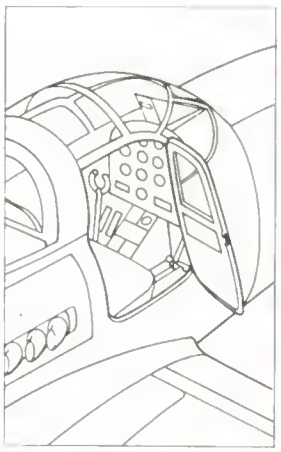
A single prototype was ordered in October 1938, which made its first flight in April 1938, demonstrating a speed of 627.6 km/h (390 mph), so that 13 service-test YP-39s were ordered in April 1939.

While the YP-39s were under construction the prototype was re-engined with a V-1710-39 without turbo-supercharger to become the XP-39B, and this and other changes, almost all reducing performance, were incorporated in the YP-39s. The first production order, for 80 P-39Cs, was placed in August 1939, but only 20 were completed. Two 7.62-mm (0.30-in) machine-guns which had been added to the original nose armament were replaced by a pair of similar weapons in each wing. Self-sealing fuel tanks were fitted. A total of 923 of the new model were delivered with the designation P-39D.

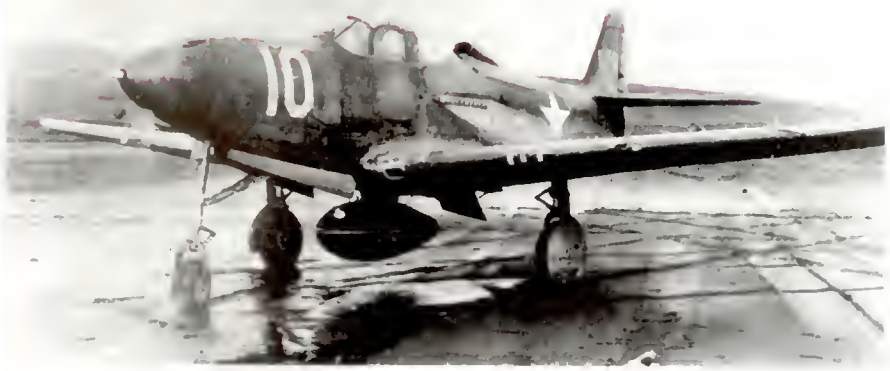
In April 1940 the RAF had ordered 675 of a

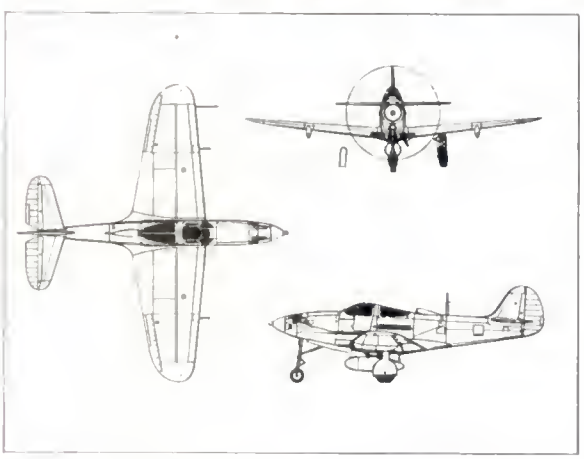
Above: A wave from a USAAF pilot during night-flying training. The picture was certainly posed for propaganda purposes, since few pilots would welcome a searchlight shining at them as this would destroy their night vision. The crutch for the bomb or drop-tank can be seen under the fuselage

Right: One of the unusual features of the Airacobra was the cockpit access. Unlike most fighters which had a sliding or hinged canopy, the Airacobra was fitted with doors like a civilian sporting aircraft. Though this made entry easy, emergency exit was occasionally more difficult than in conventional designs



Left: The mid-mounted engine not only allowed heavy nose armament to be carried, but also gave the pilot protection from the rear
Below: A drop-tank equipped P-39 in service with the Soviet air force. The Russians liked the aircraft, flying it at low altitudes against ground targets where its heavy fire-power devastated German soft-skinned vehicles





P-39N

Type: ground-attack fighter
Maker: Bell Aircraft Corporation
Span: 10.36 m (34 ft)
Length: 9.2 m (30 ft 2 in)
Height: 3.78 m (12 ft 5 in)
Wing area: 19.79 m^2 (213 sq ft)
Weight: maximum 3447 kg (7600 lb); empty 2903 kg (6400 lb)
Powerplant: one 1200-hp Allison V-1710-85 V-12 liquid-cooled engine
Performance: maximum speed 605 km/h (376 mph) at 4572 m (15 000 ft); range 1569 km (975 miles) with drop-tanks; operational ceiling 11 735 m (38 500 ft)
Armament: one 37-mm (1.46-in) M4 cannon; two 0.5-in (12.7-mm) and four 0.30-in (7.62-mm) Browning machine-guns; 227-kg (500-lb) bombload
Crew: 1
Production: 2095 (total 9558)

similar model, but with a 20-mm (0.79-in) Hispano-Suiza cannon. They were tried by 601 Sqn who rejected them. The US passed 212 to the USSR, and most of the remainder were taken over by the USAAF, given the designation P-400, and used with P-39Ds in the early stages of the Pacific war and subsequently in North Africa. A further 336 P-39D-1s, with 20-mm instead of 37-mm cannon, and 158 D-2s, with similar armament and 1325-hp V-1710-63 engines, were built for the Soviet Union.

The single XP-39E had experimental square-tipped laminar-flow wings, but an order for 4000 P-39Es was cancelled, and the next production version was the P-39F, 229 of which were built, differing from the D only in the make of propeller used; the 25 P-39Js were similar but with V-1710-59 engines. A reversion to the V-1710-63 resulted in 210 P-39Ks and 250 P-39Ls, which were again distinguished by the propeller. These had originally been part of an order for 1800 P-39Gs, none of which was delivered as such, the series continuing with 240 P-39Ms, which used the 1200-hp V-1710-83.

A final engine change, to the 1200-hp V-1710-85, was made for the two largest series of Airacobras. These were the P-39N and Q, produced for the Soviet Union, which received almost half of all P-39s: the main difference between the 2095 Ns and 4905 Qs was the substitution in the latter of two 12.7-mm machine guns for the four 7.62-mm guns in the wings, and later Qs omitted the wing guns.

J22, FFVS

FIRST FLIGHT 1942

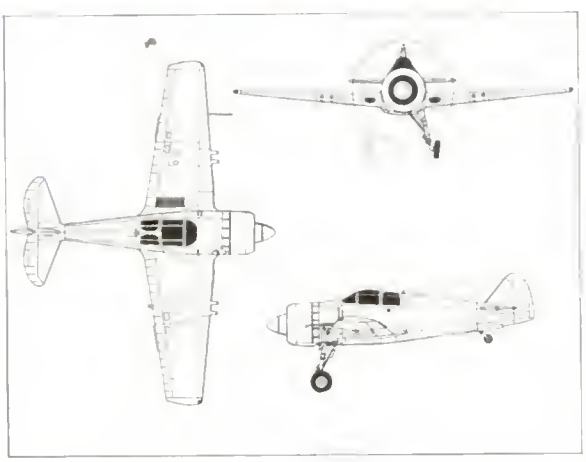
Left: The J22 in flight; while the tail looked similar to some German types, the nose had an unmistakably American appearance
Below left: The tall landing gears retracted rearwards into the fuselage
Below: The J22 served as a front-line fighter in Sweden for a little over six years; this is a J22A

THE US Government's prohibition of aircraft exports in 1940 hit Sweden particularly hard. Plans to modernize her air force were heavily dependent on new fighters ordered from Vultee and Seversky, and the 60 Seversky EP-1s that were delivered before the embargo represented barely one-sixth of the total number ordered. Buying modern fighters elsewhere proved impossible, and semi-obsolescent Fiat CR.42s and Reggiane Re 2000s could only be considered as a stop-gap.

Faced with the lack of supplies from abroad, the Swedish air force took the bold step of asking a member of the control commission, which had been overseeing the work at the Seversky factory, to organize the design and construction of a Swedish fighter. The problems faced included shortages of everything from materials to manufacturing capacity, and a prime requirement was a suitable engine, for which manufacturing licences were as difficult to find as the aircraft.

The solution was to copy, by measurement and analysis, the Pratt & Whitney Twin Wasp engine – an extremely difficult operation – but by 1942 Svenska Flygmotor was ready to begin production of its version, designated STWe3.

Several hundred small contractors produced components which were assembled by the Flygförvaltningens Verkstad (government aircraft works), housed in a hangar at Bromma airport, near Stockholm and financed by the main Swedish airline ABA, and by air force workshops. The J22, as the new fighter was designated, had been made as light as possible: construction was a combination of steel-tube framework and load-bearing plywood covering. The two prototypes were followed by 141 production J22As, armed with two 13.2-mm (0.52-in) and two 8-mm (0.315-in) machine-guns in the wings. The first was delivered in October 1943, and production was completed by 57 J22Bs, which had four of the larger-calibre machine-guns.



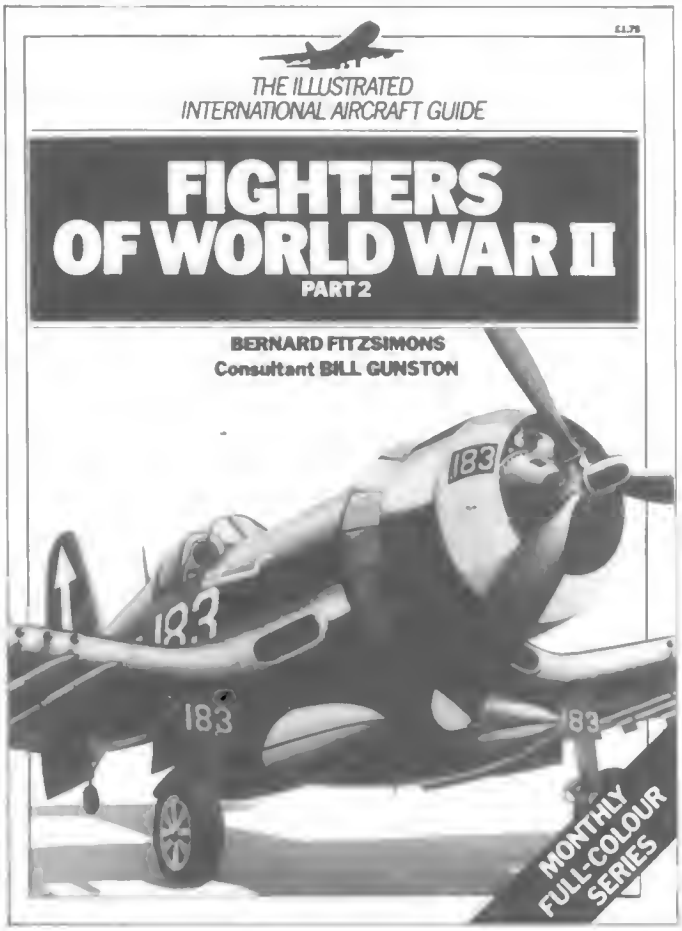
In spite of the low power available, the J22 proved respectably fast and fully manoeuvrable. It formed the basis of Sweden's fighter defences from 1944, when it replaced the Italian fighters, until the early 1950s, when it was itself superseded by the jet-powered Saab J21R and the de Havilland Vampire. The only other role undertaken by the J22 was that of photographic reconnaissance.

J22B

Type: single-seat fighter
Maker: Flygförvaltningens Verkstad; Flygvåpnet workshops, Arboga
Span: 10 m (32 ft 9¼ in)
Length: 7.8 m (25 ft 7 in)
Height: 2.8 m (9 ft 2¼ in)
Wing area: 16.01 m² (172.33 sq ft)
Weight: loaded 2835 kg (6250 lb); empty 2020 kg (4453 lb)
Powerplant: one 1065-hp Svenska Flygmotor STWc3 (Pratt & Whitney R-1830 Twin Wasp) 14-cylinder air-cooled radial
Performance: maximum speed 575 km/h (357 mph) at 3500 m (11 483 ft); range 1270 km (2044 miles); operational ceiling 9300 m (30 512 ft)
Armament: four 13.2-mm (0.52-in) Madsen M-39A machine-guns
Crew: 1
Production: 57

COMING NEXT MONTH...

Fighters of World War II Part 2 is the next title in this comprehensive civil and military aviation series. It covers the latter part of the war and includes some of the most fascinating aircraft to see action. While the Germans were employing tiny rocket fighters and twin-jet aircraft the Japanese were pressed into desperate kamikaze tactics against ships and aircraft. The Allies found new work for their fighters in ground attack and types like the Corsair and Typhoon gave lethally efficient close support to ground forces. This volume has a detailed coverage of the famous Mosquito and the German Fw 190 which was a stable mate of the Messerschmitt Bf 109. Also included is the Japanese A6M Zero which was almost a wonder weapon during the early years of the war in the Far East.



Contents include

DH.98 Mosquito
P-38 Lightning
Mitsubishi A6M
Nakajima J1N
Kawasaki Ki-45
Kawasaki Ki-61
Mitsubishi J2M
P-51 Mustang
P-47 Thunderbolt
Focke-Wulf Fw 190
Junkers Ju 88G
Grumman Hellcat
Vought Corsair
Hawker Typhoon
Nakajima Ki-84
Fairey Firefly
P-61 Black Widow
Heinkel He 219
Me 163
Meteor I
Me 262
Heinkel He 162

THE ILLUSTRATED INTERNATIONAL AIRCRAFT GUIDE

A comprehensive aviation series covering every major civil military aircraft since Man's first balloon flight to the present day

Titles already published in this series:

Early Jetliners
Modern Jetliners
Advanced Jetliners
Early Airliners
Civil Helicopters
General Aviation
Airliners of the 1930s
Piston Airliners Since 1940
Turboprop Airliners
Private Owner Aircraft
Modern Fighters Part 1
Modern Fighters Part 2
Sporting and Homebuilt Aircraft

Future titles include

Fighters of World War II Part 2
Racing and Record-breaking Aircraft
Gliders and Manpowered Aircraft
Bombers of World War II Part 1
Bombers of World War II Part 2
Pioneer Aircraft
Aerial Oddities 1900-39
Fighters 1914-18
Fighters 1919-39
Aerial Oddities 1939-45
Aerial Oddities Since 1945
Bombers Since 1945
Rockets
Spaceflight
Bombers 1914-18
Bombers 1919-39
Tactical Missiles
Strategic Missiles
Tactical Helicopters
Propeller-driven Trainers
Propeller-driven Attack Aircraft
Jet Attack and Training Aircraft
Reconnaissance Aircraft
Anti-submarine and Marine Patrol Aircraft
Military Transport Aircraft

It is not too late for you to start collecting The Illustrated International Aircraft Guide. All previous issues are still available and can be obtained by writing to the address below. If you wish to own the entire set you can place a regular order with your newsagent, and month by month your series will build into a comprehensive library of the world's aircraft

All titles are available from: Macdonald Phoebus Ltd 563 Wandsworth Road London SW8